



Research article

Relationships between professional identity, motivation, and innovative ability among nursing intern students: A cross-sectional study

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ABSTRACT

Objective: To explore the relationships among motivation, professional identity, and innovative ability of nursing intern students.

Background: Professional identity and innovative ability are important for nursing students' core competitiveness and care quality. During the internship, nursing students integrate theoretical knowledge and practice, and have a rapid growth. Motivation is positively associated with professional identity and innovative ability. However, there are limited studies examining the professional identity, motivation, and innovative ability of nursing intern students.

Design: A descriptive cross-sectional online study.

Methods: Students in the nursing schools in southwest and central of China were included in this study and conducted from June to July 2022. A total of 474 nursing intern students were recruited from 16 nursing schools. Research data were collected with "Participants' Demographics Form", "the Professional Identity Questionnaire for Nursing Students", "the Revised Life Goals Questionnaire", and "the Revised Multidimensional Innovative Questionnaire". Independent-sample t-tests, one-way analysis of variance, correlation coefficients, and structural equation modeling were used in data analysis. This study adhered to the STROBE guidelines.

Results: A significantly positive correlation was determined among the professional identity (67.55 ± 8.42), motivation (53.38 ± 5.54), and innovative ability (47.99 ± 5.46) of nursing students ($r > 0.4$, $P < 0.001$). Motivation had a mediating effect on professional identity and innovative ability ($P = 0.003$), accounting for 10.9% (0.075/0.689) of the total effect.

Conclusions: There was a positive correlation among professional identity, motivation, and innovative ability. Developing motivation and professional identity can enhance nursing intern students' ability to innovate.

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1. Introduction

Rapid developments in science and technology are forcing health institution to change [1]. Nurses are an important part in health systems [2], and improve nurses' innovative ability is an important global goal [3]. Nurses need innovative ability to enhance their capacity to deliver high-quality care [4], promote organizational competitiveness, and facilitate adaptation to change [5]. As a candidate of future nursing, nursing students should also develop innovative abilities to effectively address global health challenges. Innovation includes new idea generation and practice implementation [6,7]. Nurse students' innovative ability is important. Insufficient innovative ability will hamper the progress of modern nursing research [8]. However, the innovative abilities of nursing students remain limited [9].

Motivation plays a crucial role in shaping human behavior [10]. McClelland's motive disposition theory (MDT) divides motivation into three categories: achievement, power, and affinity motivation [10,11]. Achievement and power motivation are positively correlated with employees' psychological empowerment, helping people have positive work behavior and stronger innovative ability [12,13]. Nurse students with high affinity motivation levels are more inclined to establish close nurse–patient relationships and exhibit enhanced teamwork efficiency [14]. Motivation is also positively associated with professional identity [15].

Nurses' professional identity refers to nurses' self-perception of their profession and can be built during nursing students' internships [16]. A positive professional identity contributes nurse students to develop favorable professional perceptions [17]. Having a good professional identity can help nursing students build the core competitiveness [18], including their innovative ability [19]. Positive professional identity can enhance the nurses' care quality [15] and adjust the role pressure of nursing students [20]; moreover, it can help nurse students stay in the nursing profession after graduation [21,22], reduce their intention to quit [23,24], and increase their job satisfaction [25]. During the final-year students' internship, nursing students can put theory into practice [26], nursing educators play an important on guide students found professional values and build professional identity [27].

Innovative ability has become a major ability in nursing students [28], and more paths are needed to improve nursing students' innovation. Internships play a pivotal role in fostering the professional growth of nursing students [29,30]. However, there is a lack of research on the correlations between nursing students' professional identity, motivation, and innovative ability during the internship. Therefore, this study surveys nursing students during the internship to assess the relationship between their professional identity, motivation, and innovative ability. The hypothesis is shown in Fig. 1.

2. Methods

2.1. Research design and study setting

The study was conducted from June to July 2022 via online recruitment to collect data from nursing students in 16 schools across 11 cities. This study followed the STROBE guidelines [31] (provided in the Appendix).

The required sample size was calculated to be 5–10 times greater than the variables [32,33]. Our study contained 17 variables. Considering the possibility of invalid samples, the final sample size increased by 20%. Based on these calculations, the required sample size was 213 participants. In order to have a good fit in structural equation modeling (SEM) analyses, the sample size needs more than 200 [34]. Finally, the sample size should be more than 213.

The eligibility criteria for participants were as follows: (1) the nursing students during their internships, and (2) nursing students who provided informed consent. Exclusion criteria: participants were in a bad mental or physical condition. Returned questionnaires containing all the same options [35] was classified as low-quality response and eliminated.

The questionnaire was distributed online. Researchers used the Wenjuanxing survey platform (<http://www.wjx.cn>) to make the questionnaire, we got agreement from the faculty members of schools and then distributed the link and the invitation information to the faculty members of 6 colleges and 10 universities in southwest and central China via WeChat. Then those faculty members of nursing schools send that consent informed and questionnaire to their students through WeChat groups.

Prior to completing the questionnaire, the authors provided potential participants with a comprehensive explanation of the study's purpose and ethical considerations. After reading the informed consent form and obtaining written confirmation of their voluntary participation, participants completed the questionnaire. In total, 511 questionnaires were collected. Based on the exclusion criterion, 37 questionnaires were eliminated, and 474 questionnaires were incorporated into analysis. The recovery rate was 92.8%.

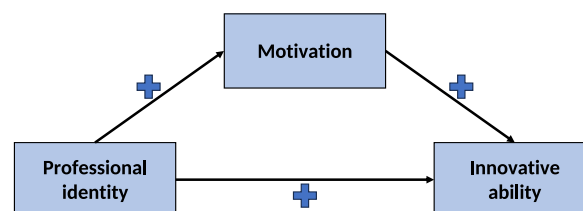


Fig. 1. Hypothesis model. Note: motivation plays a mediating role between professional identity and innovative ability in the nursing intern students.

2.2. Instruments of the study

2.2.1. Demographics

Participants' demographics included age, gender, school type, main growth environment, management experience during study, plans to pursue postgraduate studies in nursing, participation in innovation-related courses, participation in innovation-related activities, participation in an article, participation in an invention, and participation in a research project.

2.2.2. Professional identity

This study measured participants' professional identity using the Professional Identity Questionnaire for Nursing Students (PIQNS) [36]. The PIQNS is a five-point Likert scale, and consists of 17 items with a score range of 17–85 points. High scores mean high professional identity levels. The reliability and validity of each item exceeded 0.8 [36]. The PIQNS has been widely utilized among Chinese students [15,18]. During this study, Cronbach's α coefficient was 0.922 and the Kaiser-Meyer-Olkin (KMO) coefficient was 0.952.

2.2.3. Motivation

This study measured participants' motivation using the Life Goals Questionnaire (GOALS), which was revised by Liu et al. [37]. The R-GOALS includes three dimensions: achievement motivation, power motivation, and affinity motivation. Each dimension contains four items, with a score range of 12–60 points (five-point Likert scale). High scores mean pronounced motivation levels. The correlation coefficient of content validity between each item and the corresponding dimension exceeded 0.8 [37]. During this study, Cronbach's α coefficient was 0.910 and the KMO coefficient was 0.916.

2.2.4. Innovative ability

This study assessed participants' innovative ability using the Multidimensional Innovative Questionnaire, which was revised by Liu et al. [37]. The questionnaire includes two dimensions: innovation generation and innovation practice. Each dimension contained 6

Table 1
Participants' demographics (N = 474).

Variable	Quantity (n/ %)	Professional identity (M \pm SD)	T/F	Motivation (M \pm SD)	T/F	Innovation ability (M \pm SD)	T/F
Age (years)							
16–18	22 (4.6)	71.27 \pm 6.67	2.459	52.73 \pm 4.53	0.548	47.95 \pm 6.35	0.985
19–21	371 (78.3)	67.48 \pm 8.57		53.52 \pm 5.74		48.16 \pm 5.51	
22–25	81 (17.1)	66.85 \pm 7.93		52.93 \pm 4.78		47.22 \pm 4.97	
Gender							
Female	395 (83.3)	67.48 \pm 8.39	0.419	53.66 \pm 5.49	-2.402*	48.07 \pm 5.37	-0.684
Male	79 (16.7)	67.91 \pm 8.61		52.02 \pm 5.60		47.61 \pm 5.90	
School							
Junior college	184 (38.8)	65.24 \pm 8.01	4.859***	52.39 \pm 5.86	3.139**	46.71 \pm 5.29	4.151***
University	290 (61.2)	69.01 \pm 8.35		54.01 \pm 5.23		48.81 \pm 5.42	
Main growth environment							
Urban	212 (44.7)	67.93 \pm 7.80	0.897	53.89 \pm 5.22	1.783	48.68 \pm 4.99	2.497*
Countryside	262 (55.3)	67.24 \pm 8.89		52.98 \pm 5.76		47.43 \pm 5.76	
Had management experience during study							
Yes	316 (66.7)	68.30 \pm 8.31	2.771**	53.51 \pm 5.18	0.698	48.40 \pm 5.46	2.306*
No	158 (33.3)	66.04 \pm 8.46		53.13 \pm 6.20		47.18 \pm 5.39	
Plan to pursue postgraduate studies in nursing							
Yes	343 (72.4)	67.96 \pm 8.13	1.735	53.56 \pm 5.53	1.138	48.27 \pm 5.41	1.827
No	131 (27.6)	66.47 \pm 9.06		52.92 \pm 5.55		47.25 \pm 5.55	
Participated in innovation-related course							
Yes	333 (70.3)	67.22 \pm 8.33	-1.310	53.42 \pm 5.81	0.238	47.96 \pm 5.22	-0.206
No	141 (29.7)	68.33 \pm 8.60		53.29 \pm 4.84		48.07 \pm 6.01	
Participated in innovation-related activities							
Yes	339 (71.5)	67.23 \pm 8.25	-1.282	53.55 \pm 5.71	1.045	48.00 \pm 5.33	0.072
No	135 (28.5)	68.33 \pm 8.81		52.96 \pm 5.06		47.96 \pm 5.80	
Participated in an article							
Yes	28 (5.9)	66.32 \pm 6.45	-0.795	53.00 \pm 4.30	-0.378	47.25 \pm 4.61	-0.741
No	446 (94.1)	67.63 \pm 8.52		53.41 \pm 5.61		48.03 \pm 5.51	
Participated in an invention							
Yes	22 (4.6)	65.14 \pm 9.54	-1.378	54.41 \pm 5.00	0.889	48.64 \pm 7.95	0.567
No	452 (95.4)	67.67 \pm 8.35		53.33 \pm 5.56		47.96 \pm 5.32	
Participated in a research project							
Yes	139 (29.3)	66.00 \pm 7.71	-2.596*	53.58 \pm 4.67	0.485	47.89 \pm 5.38	-0.255
No	335 (70.7)	68.19 \pm 8.62		53.30 \pm 5.86		48.03 \pm 5.50	
Total score		67.55 \pm 8.42		53.38 \pm 5.54		47.99 \pm 5.46	

M: mean; SD: standard deviation; T: T-value; F: F-value; *P < 0.05; **P < 0.01; ***P < 0.001.

items, with a score range of 12–60 points (five-point Likert scale). High scores mean high innovative ability levels. The correlation coefficient of content validity between each item and the corresponding dimension exceeded 0.7 [37]. This questionnaire has been used to test the innovative ability of health and nursing personnel [38]. During this study, Cronbach’s α coefficient was 0.914 and the KMO coefficient was 0.930.

2.2.5. Data analysis

This study conducted the statistical analyses using Excel (Microsoft, Redmond, WA, USA), SPSS 23.0 (IBM, Chicago, IL), and Amos 28.0 (IBM, Armonk, NY). It used Excel to import the questionnaire data; SPSS 23.0 to perform an independent-samples *t*-test, one-way analysis of variance (ANOVA), Pearson’s correlation coefficient analyses; Amos 28.0 to establish a structural model, in which bootstrapping was used to compute the latent variable intermediate effect. The chi-square degree of freedom ratio (χ^2/df) was <3 ; the root mean square error of approximation (RMSEA) was <0.06 ; and the comparative fit index (CFI), goodness-of-fit index (GFI), and incremental fit index (IFI) were all >0.9 . Therefore, the model had acceptable fit (Hooper et al., 2007b). $P < 0.05$ was considered statistically significant.

2.2.6. Ethical considerations

This study was approved by the Ethics Committee of West China Hospital of Sichuan University and the approval number was No. 2021(277). All participants provided written informed consent. All procedures were carried out in accordance with the 1964 Helsinki Declaration and its later amendments.

3. Results

3.1. Demographics

Table 1 shows the participants’ demographics. This study includes 395 females (83.3%) and 79 males (16.7%). Most of the students are all undergraduates (61.2%, 290/474). By comparing the means, the school type, main growth environment, and management experience variables have statistically significant effects on innovative ability.

3.2. Correlation

Table 2 shows a positive correlation among the professional identity, motivation, and innovative ability ($P < 0.01$). Professional identity associates with both motivation ($r = 0.420$) and innovative ability ($r = 0.636$). Additionally, a positive association exists between motivation and innovative ability ($r = 0.413$).

3.3. Hypothesis test

Fig. 2 shows the model of the nursing students’ professional identity, motivation, and innovative ability. The model has good fit ($\chi^2/DF = 2.359$, RMSEA = 0.054, CFI = 0.992, GFI = 0.989, IFI = 0.992).

Table 3 shows that professional identity directly contributes to improving motivation ($\beta = 0.451$, $P < 0.001$) and innovative ability ($\beta = 0.613$, $P < 0.001$), while motivation directly contributes to enhancing innovative ability ($\beta = 0.167$, $P < 0.001$).

This study verified the intermediate effect of the target tendency via bootstrapping in Amos28.0 and used 5000 runs to obtain a confidence level of $<95\%$. The results in Table 4 show that motivation had a mediating effect between professional identity and innovative ability, accounting for 10.9% (0.075/0.689) of the total effect.

4. Discussion

The results revealed a positive correlation between nursing students’ motivation, professional identity, and innovative ability, with motivation playing an intermediary role in the influence of professional identity on innovative ability. These findings suggest that nursing educators should enhance students’ innovative ability and behavior by promoting professional identity and motivation in

Table 2
Correlations among variables ($N = 474$).

Variable	1	2	3	4	5	6	7	8
1. Professional identity	1.000							
2. Motivation	0.420**	1.000						
3. Achievement motivation	0.290**	0.761**	1.000					
4. Power motivation	0.333**	0.838**	0.393**	1.000				
5. Affinity motivation	0.413**	0.877**	0.593**	0.632**	1.000			
6. Innovative ability	0.636**	0.413**	0.294**	0.352**	0.365**	1.000		
7. Innovation generation	0.615**	0.377**	0.290**	0.308**	0.338**	0.933**	1.000	
8. Innovation practice	0.574**	0.394**	0.260**	0.350**	0.344**	0.936**	0.746**	1.000

** $P < 0.01$.

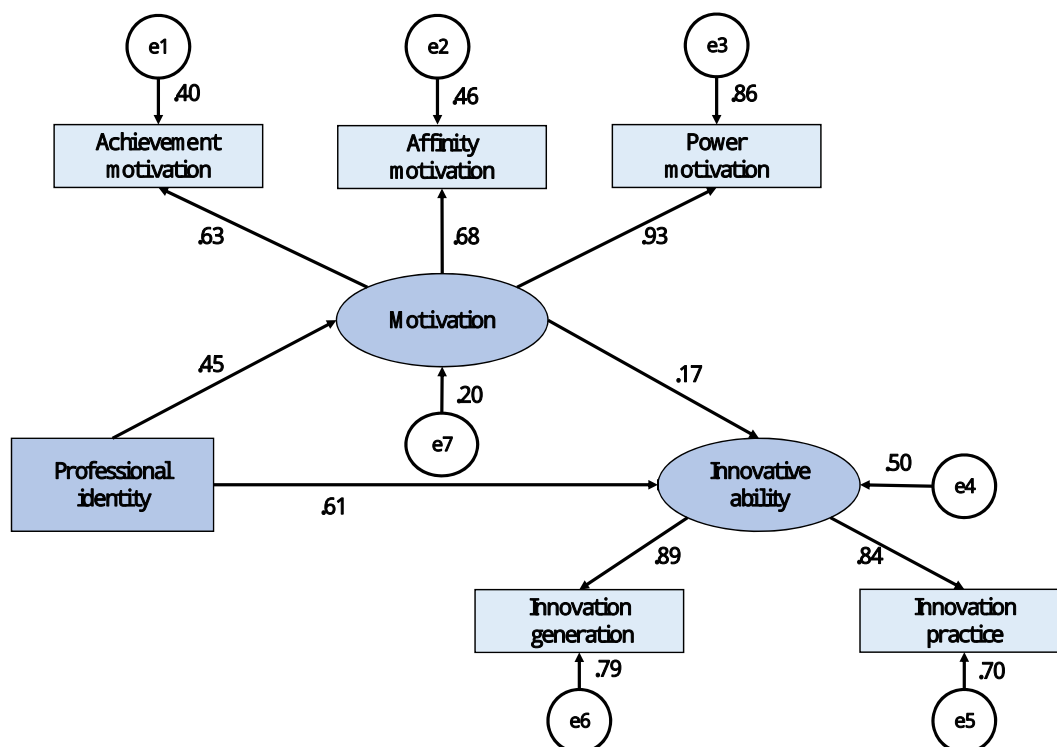


Fig. 2. Structural equation model of nursing interns’ professional identity, motivation, and innovative ability.

Table 3
Mediation effect path test results.

Path	Standardized estimate	Estimate	SE	CR	P
professional identity→motivation	0.451	0.444	0.044	10.153	<0.001
motivation→innovative ability	0.167	0.147	0.043	3.446	<0.001
professional identity→innovative ability	0.613	0.531	0.040	13.382	<0.001

SE: Standard Error; CR: Critical Ratio.

Table 4
Bootstrap analysis results of mediation effect test.

Effect category	Path	Standardized estimate	Bootstrap 95% CI [#]		P
			Lower	Upper	
Mediation effect	professional identity→motivation→innovative ability	0.075	0.024	0.158	0.003
Direct effect	professional identity→innovative ability	0.613	0.506	0.707	<0.001
Total effect		0.689	0.617	0.753	<0.001
r		0.109	0.033	0.234	0.003

#CI: confidence interval.

addition to targeted innovation training.

The professional identity score was 67.55 ± 8.42 , which exceeds the scores obtained by Zhang et al. [39] (62.02 ± 12.02) and Wang et al. [15] (61.60 ± 10.06). This probably due to all participating nursing students were undergoing internships, which may have potentially contributed to their heightened sense of professional identity [39]. In current research, 72.4% of the participants had career plans, such as pursuing postgraduate studies in nursing. Career planning is positive correlation with professional identity [27], therefore this possible positively have an impact on their professional identity. The non-university nursing students scored lower than university students, which is similar to the previous study [40]. Compared with university nursing students, non-university nursing students, most of whom were probably poorly educated in high school, choose nursing as a major in order to find a better job. Meanwhile, non-university nursing students also had lower motivation scores in our study.

This study’s result for motivation was consistent with that of Yi et al. [14] in that achievement motivation scored the highest among the three motivation types, whereas power motivation scored the lowest; this was also consistent with the finding of Liu et al. [37].

Moreover, highly demanding millennial medical students had been shown to demonstrate strong affiliation and achievement needs [41].

The innovative ability score (47.99 ± 5.46) exceeded that in the study of He et al. [38] (42.77 ± 5.25), which probably because in the current study, most of the participants were undergraduate students (61.2%, 290/474) and had management experience in their school (66.7%, 316/474). Moreover, in this study, over 70% of the participants took part in innovation-related courses and activities, which is in line with the development of promoting nurses' innovative ability through such activities [42]. However, this study found that few participants exhibited innovative ability (4.6%–29.3%), indicating a potential gap between innovative education and application. Many possible barriers that students may face, including challenging innovative education content [43], social system constraints [44], or lack of opportunities, prevent them from applying their innovative skills in real-world scenarios. Further research should delve into the students' experiences during internships, seeking to understand whether some specific challenges or barriers hinder the translation of innovative knowledge into practice and explore effective strategies to support students.

This research showed an association between professional identity and innovative ability, which aligns with the previous studies [15,19]. Clinical internships play pivotal roles in shaping nursing students' professional identity through the integration of theoretical knowledge and practice [45]. Therefore, it is imperative to enhance the training and development of nursing students' professional identity during internships; doing so can also enhance their job satisfaction [21] and have good care quality [15]. Therefore, nursing educators should develop and promote nursing students' professional identity by training in reflection skills [46] and critical thinking [47], incorporating clinical simulations into curricula [48], and establishing positive role models [49].

This research confirmed a correlation between motivation and innovative ability, which aligns with the prior investigations [12, 50]. Motivation is the necessary condition for achieving innovation [12], and achievement and affinity motivations are positively related to team cooperation and efficiency [14]. This study further revealed that motivation has a mediating effect on professional identity and innovative ability. In practice, nursing students have better professional identity and will tend to establish better nurse–patient relationships, resulting in a favorable nursing experience and practice atmosphere that may increase their motivation and effectively improve their innovative ability [51].

4.1. Limitations

This study was quantitative, with its inherent inability to provide nuanced explanations for the observed patterns or relationships between motivation, professional identity, and innovative ability. It will be beneficial to add qualitative research methods in future studies, such as interviews or focus groups, which could offer richer insights into the intricacies of nursing students' experiences. Second, the study used a convenient sample and only included the final-year nursing students of non-university and university nursing students; therefore, it is not representative of all levels of nursing schools and all grades of nursing students. Third, the study could not explore the correlations between professional identity, motivation, and innovative ability across different internship stages. In the future, it will be beneficial to conduct longitudinal investigations of various internship stages to analyze their impact on clinical practice.

5. Conclusions

This study revealed a positive correlation between the professional identity, motivation, and innovative ability of nursing students. Motivation had a mediating effect on professional identity and innovative ability. This study's results provide novel insights for nursing educators to enhance the students' innovation. Strengthening the cultivation of professional identity during clinical practice can improve nursing students' innovative ability and foster their advancement in the nursing field.

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Data availability statement

Due to the ethics of this research, the data was not shared in a publicly available repository. Data used to support the findings of this study are available from the corresponding author upon request.

CRediT authorship contribution statement

Jiayi Zhu: Writing – original draft, Validation, Formal analysis, Data curation. **Xiaofeng Xie:** Writing – review & editing. **Lihui Pu:** Writing – review & editing. **Ling Zou:** Writing – review & editing. **Shuai Yuan:** Investigation. **Liqin Wei:** Investigation. **Fengying Zhang:** Writing – review & editing, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e28515>.

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