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# The impact of leadership of head nurses on the research performance of highly educated nurses in China: a moderated mediation model

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## Abstract

**Background** Nursing leadership by head nurses is critical to enhancing nursing research activity and performance in hospitals but the impact mechanism is unclear.

**Aim** To investigate the effect of nursing leadership of head nurses on research burnout, self-efficacy, and performance of highly-educated nurses in the hospital.

**Methods** A cross-sectional survey was conducted and electronic questionnaires were distributed online. An online data analysis tool SPSSAU was adopted to conduct descriptive analysis, correlation analysis, and structural equation model construction. This study adhered to the STROBE guideline.

**Results** A total of 1918 questionnaires were collected in this survey. The results indicated that nursing research leadership of head nurses ( $\beta = 0.094, p < 0.001$ ) could directly affect the research performance of highly-educated nurses or indirectly via research burnout ( $\beta_1 = -0.287, p < 0.001, \beta_2 = -0.071, p = 0.002$ ). The indirect effect accounted for 12.74% of the total mediating effect. The research self-efficacy of highly-educated nurses was a moderator in the mediation model, and research leadership had no significant effect on research performance when the self-efficacy of nurses was low, while the direct effect [ $B_{M-SD} = -0.041, CI(-0.098, 0.017)$  vs  $B_M = 0.094, CI(0.051, 0.138)$  vs  $B_{M+SD} = 0.229, CI(0.171, 0.287)$ ] of research leadership and the indirect effect [ $B_{M-SD} = -0.004, CI(-0.021, 0.012)$  vs  $B_M = 0.010, CI(0.004, 0.018)$  vs  $B_{M+SD} = -0.031, CI(-0.051, -0.012)$ ] of research burnout existed when the research self-efficacy was in mean and high level.

**Conclusions** Research leadership of head nurses and self-efficacy of highly-educated nurses are crucial to enhancing nursing research performance in the hospitals.

## Highlights

What is already known about the topic?

1. Highly educated nurses in the hospital are the main force in implementing clinical nursing research, but the situation of nursing research activities are not satisfactory due to various barriers.
2. Nursing leadership of head nurse is important in enhancing nursing research activities conducted by clinical nurses.

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What this paper adds?

1. The research leadership of head nurses could directly affect the research performance of highly educated nurses.
2. The research leadership of head nurses could affect the research performance of highly educated nurses under the mediating of their research burnout.
3. Implementing research leadership for highly educated nurses with low research self-efficacy is likely to be ineffective.

**Keywords** Clinical nurses, Head nurse, Research burnout, Research leadership, Research performance, Self-efficacy

## Background

Nursing research is a systematic process that uses scientific inquiry to explain the essence of nursing phenomena, explore the laws of nursing activities, generate new nursing ideas and knowledge, solve problems in nursing practice, nursing education, and nursing management, provide reliable and valuable evidence for nursing decision-making, and enhance the importance of the nursing discipline, which is important to transform clinical nursing and ensure high-quality care [1]. Hence, the research ability [2], output [3], and transformation [4] of clinical nurses are always concerned. With the development of nursing discipline both domestically and internationally, more and more nursing graduates with doctoral and master's degrees are entering the workforce at hospitals and put in an important role in nursing research to enhance the development of the nursing discipline in China [5, 6]. However, due to the relatively late introduction of postgraduate education in China [7], many current head nurses lack a master's degree, which meant that they have deficient awareness and experience of nursing research to sympathize and support the highly educated nurses to get out of a dilemma of balancing nursing research and busy clinical care. Clinical nurses are the main personnel for conducting nursing research as they are the closest to patients [8]. However, nursing research in clinical practice is not very active [2], and this could be due to various barriers, including poor knowledge and skill [4], as well as insufficient time and resources [9, 10]. Consequently, highly educated nurses (nurses with master's degree or above) may experience increased negative emotions, when facing challenges in conducting nursing research, such as the burnout. Leadership has been identified to be a key factor for facilitating nursing research [3], but little is known about the mechanism of how leadership affect the output, academic influence and favorable condition obtained from conducting nursing research (which was also called research performance [11]) and what are the important mediators or moderators. In this research, a structural equation model of leadership and nurse research performance

was constructed to better understand the pathway and important variables related to nursing research in clinical practice.

Many researchers have explored the impact of leadership on nursing research (e.g., idea exploration, generation, implementation, productivity, and time allocation) [12–15], and found the insufficient leadership of head nurses on nursing research through qualitative study [16]. On the contrary, few researchers have conducted quantitative studies on nursing research leadership of head nurses and further exploration of its impact mechanism on clinical nursing research due to the lack of specific tools for evaluating leadership in nursing research. In this study, the Head Nurse Research Leadership Scale [13], developed by our research team, was used to conduct quantitative analysis and provide a better understanding of nursing research leadership. Meanwhile, the highly educated nurses have the ability and potential to carry out nursing research, so this study took them as the investigation objects.

## Theoretical framework

The Leader-Member Exchange theory (LMX) [17] and Job Demands—Resource Theory (JD-R) [18] were used to support the hypothesis of this study. According to LMX, the relationships between leaders and their staff were divided into two types according to the quality: low or high. Leaders tend to give more attention, understanding, support, and opportunities to employees with a high-quality relationships and enable them to meet their needs, improve work performance, and obtain achievements based on this relationship. JD-R revealed that job characteristics can be divided into requirements and resources, which could affect employees in two ways: loss and gain. The process of resource and energy loss can be triggered when work demands are too high or resources are insufficient, leading to negative organizational outcomes (such as low work performance). However, abundant job resources can stimulate motivation gains for employees, resulting in positive work impacts (e.g. high organizational commitment). According to LMX and JD-R, the head nurse could provide resources to nurses who in high quality relationships to promote their nursing

research activities by implement research leadership, such as more time and staff allocation for research conduction. Adequate resources and accompanying achievements will lead to nurses’ research burnout reduction and increasing motivation to continue nursing research, which may be contributed to better nursing research performance.

**Nursing research leadership, burnout, self-efficacy, and performance of nursing research**

Nursing leadership of head nurses is important to improve the working environment [19], nurses’ mental health [20], and patient safety [21], as well as innovation behavior [22]. However, there is a huge difference between nursing research leadership and ordinary leadership in clinical practice. Research leadership involves guiding and supporting a research team to achieve a common goal through expertise, influence, and management skills [23], which required them have different abilities compared with daily affairs management in the ward, such as inspiring of scientific thinking and obtaining external resource related to nursing research.

Occupational burnout was defined as a phenomenon characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment [24], which had been proved to affect nurses performance negatively, including daily care, turnover intention, and innovation behavior [25–27]. According to Zhang [28], the research burnout referred to various adverse psychological reactions that occurred due to the inability to successfully achieve research goals such as expectations, professional title evaluations, or self achievement motivations, such as anxiety, fatigue, low efficacy, and a sense of powerlessness. In China, nursing research have become an essential component of the daily work of highly educated clinical nurses. However, the shortage of nurses stresses

them to balance their busy daily care and the pressure of scientific research, thereby morelikely to result in unnecessary burnout and poor research performance.

Self-efficacy is a subjective assessment of an individual’s attitude in completing a given task, which has a multifaceted impact on subsequent behavior [29], including the process of selection, thinking, motivation, and psychosomatic reaction [29]. These could influence the progress and outcome of research activities, especially for nurses. Research self-efficacy has been identified to be positive associated with research performance in previous study [30]. Since self-efficacy may play a role in multiple psychological processes in the duration of nurses’ scientific research conduction, it would be analyzed as a moderating variable in this study.

Scientific research performance is an indicator to evaluate the research activity of nurses and can be measured by either qualitative, quantitative, or comprehensive methods [31]. In this study, the comprehensive method was adopted, and the research output was assigned a weight coefficient according to its type and level [32].

*Hypothesis 1* Nursing research leadership of the head nurse is associated with the research performance of highly-educated nurses in their department.

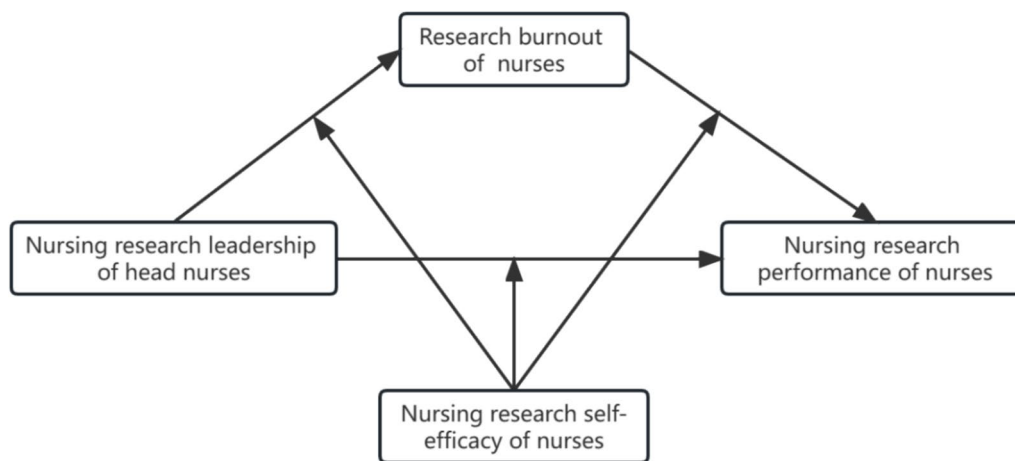
*Hypothesis 2* Research burnout is a mediator between nursing research leadership and the research performance of highly-educated nurses.

*Hypothesis 3* Research self-efficacy is a moderator in the relationship between nursing research leadership, burnout, and the performance of highly-educated nurses. The logic framework diagram was shown in Fig. 1.

**Method**

**Study design and samples**

This was a nationwide cross-sectional study, and electronic questionnaires were collected from 59 hospitals



**Fig. 1** Logic framework diagram

in 22 provinces in China. The sampling process was conducted as follows: (1) four or five representative provinces were selected from the eastern, western, southern, northern, and central regions of the Chinese Mainland, (2) two or three Class A tertiary (The highest level of hospitals in China) hospitals were selected in each province because of the high number of highly educated clinical nurses, and (3) electronic questionnaires were distributed after consultation with the nursing department of the hospital. The inclusion criteria were: (1) registered nurses with a master's degree or above, including part-time registered nurses studying for a master's degree, (2) associated with fixed clinical departments, and (3) had no management position. The exclusion criteria were: (1) working in the management department (such as the nursing department). The study was reported based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [33]. An informed consent page would appear before the subjects began to fill in the questionnaire so that to ensure that the informed consent to participate of each subjects in the study were all obtained.

## Measurement

### **General information scale**

A general information scale was developed according to the research objective, including information of head nurses and clinical nurses, such as sex, age, length of employment, technical title, and more. The detailed information is listed in Table 1.

### **Nursing research leadership scale (NRLS)**

The NRLS was developed by our research group in 2022 [13], which included 15 items in five dimensions (foresight, influence, inspiring, decisiveness, and control) to assess the leadership of head nurses as perceived by clinical nurses. The rating was a five-point (0~4) Likert scale ("Fully disagree" to "Fully agree"). The total score ranged from 0 to 60 points, with higher scores indicating a greater level of nursing research leadership. The scale has good reliability and validity according to Guo [13] and the Cronbach's  $\alpha$  was 0.897 in this study.

### **Scientific research burnout scale (SRBS)**

The SRBS [28] was used to assess the research burnout of clinical nurses, which included 22 items in three dimensions (emotion exhaustion, ineffectiveness, and sarcastic attitude) and seven items with reverse scoring. The Likert five scoring (1~5 was "Fully disagree" to "Fully agree") method was adopted. The total score ranged from 22 to 110 points, and higher scores indicated more serious burnout towards scientific research. According to Zhang [28], the internal consistency reliability, criterion-related

validity, discrimination, construct validity, convergent validity and discriminant validity of the scale met the requirements of measurement. The Cronbach's  $\alpha$  was 0.923 in this study.

### **Research self-efficacy scale (RSES)**

RSES was used to assess the self-efficacy of clinical nurses to conduct nursing research [34], and was identified to have good reliability and validity in the Chinese population. This scale included 21 items in four dimensions (idea generation, hypothesis formation, research performance, and data presentation). The Likert five scoring (1~5 was "No confidence" to "Fully confidence") method was adopted in this scale. The total score ranged from 21 to 105 points and higher scores indicated more confidence in nursing research activity. According to Sun [34], the scale has good reliability and validity. In this study, the Cronbach's  $\alpha$  was 0.875.

### **Scientific research performance (SRP)**

Scientific research performance was calculated according to the quantity, academic level, and author contribution degree of the scientific research achievements as reported by the nurses. This would include published papers, scientific achievement awards, projects, patents, and new technology utilization. The detailed scoring method is explained in Supplementary 1, and higher scores indicated better scientific research performance.

### **Ethical considerations and data collection**

This study was approved by the Ethics Committee of the First Affiliated Hospital of Zhengzhou University. All of the questionnaires were anonymous, and data was only available to research team members. The questionnaires were collected online from 1 February 2023 to 16 March 2023. To approach the participants more easily, we contacted the nursing department of each hospital and obtained their informed consent firstly, then an electronic questionnaire was distributed in the Wechat group composed of the highly-educated nurses in their hospital. In order to ensure that respondents meet the inclusion and exclusion criteria, we invited nurses to fill in the inclusion criteria and exclusion criteria in the form of questions in front of the electronic questionnaire. Those who did not meet the inclusion criteria or exclusion criteria would directly jump to the end interface, while those who met the inclusion criteria would enter the formal investigation interface and came to a informed consent process, in which the nurses were told the content of this research and if the respondents did not agree to participate in the study, they can withdraw directly, and the completed respondents would be considered as voluntary participants in the study.

**Table 1** The general information of subjects (N= 1918)

Index	Frequency(percentage)/ Median (Quartile)	research performance(Median)	H/Z/r	P
<b>daily working</b>			61.855	< 0.001
full-time clinical nurse	1168(60.9)	3.67		
part-time research nurse	663(34.6)	4.67		
full-time research nurse	87(4.5)	5.67		
<b>nurse education</b>			127.262	< 0.001
Part-time master's degree in study	206(10.7)	0.50		
Graduated from part-time master's degree	279(14.5)	4.67		
Full-time master's degree	1406(73.3)	3.83		
Doctor's degree	27(1.4)	6.17		
<b>nurse sex</b>			23,265.500	< 0.001
male	357(18.6)	5.17		
female	1561(81.4)	4.00		
<b>nurse title</b>			96.136	< 0.001
primary	948(49.4)	4.33		
middle	901(47)	3.50		
Sub-senior	60(3.1)	43.83		
senior	9(0.5)	16.00		
<b>marital status</b>			29.341	< 0.001
unmarried	1028(53.6)	4.50		
married	872(45.5)	3.67		
divorce	9(0.5)	2.67		
widowed	9(0.5)	16.00		
<b>Employment form</b>			33.245	< 0.001
Temporary employment	72(3.8)	6.92		
contract labor	553(28.8)	3.17		
Personnel Agency	612(31.9)	4.83		
Hospital staffing	528(27.5)	3.50		
School staffing	117(6.1)	4.33		
others	36(1.9)	3.33		
<b>Income</b>			97.918	< 0.001
< = 5000	177(9.2)	5.00		
5001 ~ 10,000	967(50.4)	4.17		
10,001 ~ 15,000	642(33.5)	3.17		
15,001 ~ 20,000	105(5.5)	8.67		
> 20,000	27(1.4)	12.67		
<b>head nurse sex</b>			4.734	0.030
male	72(3.8)	4.67		
female	1846(96.2)	4.17		
<b>head nurse title</b>			12.633	0.002
middle	661(34.5)	3.33		
Sub-senior	1053(54.9)	4.33		
senior	204(10.6)	4.67		
<b>head nurse education</b>			112.427	< 0.001
Undergraduate or below	69(3.6)	4.83		
Part-time master's degree in study	809(42.2)	3.17		
Graduated from part-time master's degree	567(29.6)	4.33		
Full-time master's degree	455(23.7)	5.83		
Doctor's degree	18(0.9)	9.75		
<b>Years since graduation</b>	2(1,3)		0.143	< 0.001

**Table 1** (continued)

Index	Frequency(percentage)/ Median (Quartile)	research performance(Median)	H/Z/r	P
<i>nurse employed experience</i>	3(2,6)		-0.121	<0.001
<i>nurse age</i>	29(27,31)		-0.044	<0.001
<i>Proportion of scientific research shifts</i>	13(0,25)		0.160	<0.001
<i>head nurse age</i>	42(38,46)		0.054	0.018
<i>Number of night shifts in last year</i>	36(14,70)		-0.115	<0.001
<i>head nurse employed experience</i>	18(11,22)		0.036	0.114

**Data quality inspection**

The questionnaires were initially screened through the system settings of the electronic questionnaire collection platform. A questionnaire would be regarded as invalid if the selection consistency rate of all scale items was greater than 90% or if the time to complete the questionnaire was less than 5 min (the time to complete the questionnaire measured by the pre-survey before the formal survey ranged from 5.5 to 12 min). The researchers then reviewed the questionnaire at a time. Illogical questionnaires would also be considered invalid (e.g. a responder reported that she was 26 years old and had been working for 7 years, which was obviously not in line with the reality, because that the graduate degree is about 24 to 26 years old in China). Finally, 35 questionnaires were regarded as invalid, and the efficiency was 98.2%.

In this study, the questionnaires were all collected online at the same time, which might lead to common method bias [35]. Thus, we conducted the Harman single-factor test for all the item scores to assess the common method bias for the sample data. Tang reported the criteria of non-common method bias as follows: (1) more than one factor with characteristic root > 1, and (2) the variance interpretation of the largest factor < 40% or 50% [36]. The results in this study revealed eight factors with characteristic root > 1, and the maximum variance interpretation rate was 31.956%, indicating that the common method bias of the data was acceptable.

**Statistical analysis**

SPSSAU (spssau.com) was used to conduct data analysis in this study. The general information of subjects was described as mean ± standard (M ± SD), frequency, and percentage. The data were all standardized before analysis. The SRP difference between groups was analyzed using non-parametric tests, including the Kruskal–Wallis test and Mann–Whitney test. The Pearson or Spearman correlation analysis was used to analyze the correlations among variables. In order to exclude the interference of data aggregation on the results, the intraclass correlation

coefficient (ICC) was first calculated using the multilevel linear model (HLM). The result showed that the ICC was 0.010, implying that 1% of the variation in research performance was caused by nurses’ different hospitals. It has been known that the variation caused by data aggregation was negligible when the ICC value was less than 0.059 [37]. Therefore, the HLM was not used in this study. The bootstrap method was used to analyze the mediation and moderation effect. Model 59, developed by Hayes (<http://www.afhayes.com>) in moderated mediation analysis, was used to analyze the mediating effect of burnout and the moderating effect of self-efficacy. Some of the general information was set as the control index, such as sex, age, and work experience. The bootstrap method was used to test the mediating effect and the indirect effect with a 95% confidence interval. In the moderating analysis, the high and low levels of the moderating variable were set as “Mean – SD” and “Mean + SD”, respectively. The sampling bootstrap was 5000 and the statistical significance level was set at α = 0.05.

**Results**

**Demography and work-related characteristics of head nurses and clinical nurses**

A total of 1953 nurses participated in this survey, but 35 invalid questionnaires were deleted. The effective rate of the questionnaire was 98.2%. Of all the participants, 87 (4.5%) nurses worked in full-time scientific research positions, and 663 (34.6%) nurses had part-time research positions. The detailed characteristics of the clinical nurses and head nurses are displayed in Table 1.

**Correlation analysis**

The results of correlation analysis demonstrated that the scientific research performance of clinical nurses was positively correlated with the nursing research leadership of head nurses (r=0.048, P<0.01) (which verified the hypothesis 1), but was negatively correlated with research burnout in clinical nurses (r=-0.347, P<0.001). The scores of SRP, SRBS, RSES, HNRLS, and other correlations among variables are displayed in Table 2.

**Table 2** Descriptive statistics and correlations among the key variables (n = 1918)

	Median (Quartile) or Mean(SD) of scale scores	research performance	research burnout	research leadership of head nurse
research performance	4.3(2.2,8)	1		
research burnout	60.36(13.11)	-0.347***a	1	
research leadership of head nurse	41.80(12.59)	0.048**a	-0.369***b	1
research self-efficacy	84.72(12.25)	/	/	/

\*\* P < 0.01, a: Spearman analysis, b: Pearson analysis

**Testing the mediation model**

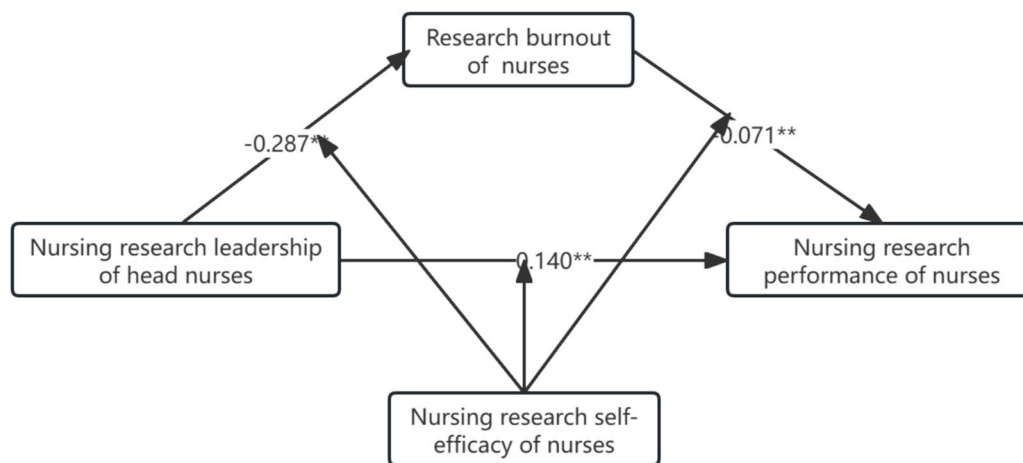
After adjusting the demographic variables, the total effect ( $\beta = 0.160$ , 95%CI[0.115 ~ 0.205]) and the direct effect ( $\beta = 0.140$ , 95%CI[0.093 ~ 0.186]) of head nurse research leadership on the scientific research performance of highly-educated nurses were significant. The indirect effect of head nurse research leadership on scientific research performance was also significant ( $\beta = -0.287^* (-0.071) = 0.020$ , 95%CI[0.004 ~ 0.039]), accounting for 12.74% ( $-0.287^* - 0.071 / 0.160 = 12.74\%$ ) of the total effect. The detailed results are displayed in Table 3 and Fig. 2.

**Testing the moderated mediation model**

After self-efficacy was added as a moderating variable into the structure model, the interaction effects of research self-efficacy and head nurse research leadership ( $\beta = 0.135$ , 95%CI[0.096, 0.174]), research burnout ( $\beta = 0.203$ , 95%CI[0.164, 0.242]) as well as head nurse research leadership ( $\beta = -0.134$ , 95%CI[-0.169, -0.099]) were all significant (Table 4). The results of simple slope analysis indicated that the 95%CI of the direct effect included 0 when the research self-efficacy was low, but excluded 0 at the mean and high levels, indicating that research self-efficacy could moderate the

**Table 3** The mediating effect of academic burnout (n = 1918)

	Y	X	R <sup>2</sup>	B	SE	t	p	95%CI
<b>Model 1</b>	<b>c</b>	<b>research performance</b>	<b>0.252</b>	<b>0.160**</b>	<b>0.023</b>	<b>6.981</b>	<b>&lt;0.001</b>	<b>0.115 ~ 0.205</b>
Model 2	a	research burnout	0.284	-0.287**	0.022	-12.777	<0.001	-0.331 ~ -0.243
Model 3	c'	research performance	0.256	0.140**	0.024	5.858	<0.001	0.093 ~ 0.186
	b	research burnout		-0.071**	0.023	-3.046	0.002	-0.117 ~ -0.025



**Fig. 2** The influence pathway among nursing research leadership of head nurse, research burnout, self-efficacy and performance of nurses  
\*\*p < 0.01

**Table 4** The mediating effect of academic burnout and the moderating effect of research self-efficacy (n = 1918)

	Y	X	$\beta$	SE	t	p	95%CI	R <sup>2</sup>	F
Model 1	research performance	research leadership of head nurse	0.094	0.022	4.248	< 0.001	(0.051, 0.137)	0.418	54.248
		research self-efficacy	0.16	0.024	6.667	< 0.001	(0.113, 0.207)		
		research leadership of head nurse*research self-efficacy	0.135	0.02	6.869	< 0.001	(0.096, 0.174)		
		research burnout	-0.082	0.025	-3.315	0.001	(-0.131, -0.033)		
		research burnout*research self-efficacy	0.203	0.02	10.073	< 0.001	(0.164, 0.242)		
Model 2	research burnout	research leadership of head nurse	-0.121	0.021	-5.729	< 0.001	(-0.162, -0.080)	0.458	69.55
		research self-efficacy	-0.401	0.021	-19.102	< 0.001	(-0.442, -0.360)		
		research leadership of head nurse*research self-efficacy	-0.134	0.018	-7.535	< 0.001	(-0.169, -0.099)		

direct effect of head nurse research leadership on the research performance (Table 5 and Fig. 3). In Table 6, the 95%CI of indirect effect included 0 when the research self-efficacy was at low and high levels but excluded 0 at the mean level, indicating that research self-efficacy could also moderate the indirect effect of head nurse research leadership on the research performance of highly-educated nurses (Table 6, Fig. 4 and Fig. 5).

**Discussion**

Although the role of nursing leadership has been emphasized to enhance nursing research activity and performance [3, 12], only a few researchers have conducted a quantitative analysis of nursing research leadership and its effects. To our knowledge, this is the first study that linked nursing research leadership of head nurses, burnout, self-efficacy, and research performance of highly-educated nurses. In this study, we used tools developed by our team to quantify nursing research leadership and

further analyze its impact on nurses’ scientific research performance, establishing the foundation for future research on nursing research leadership.

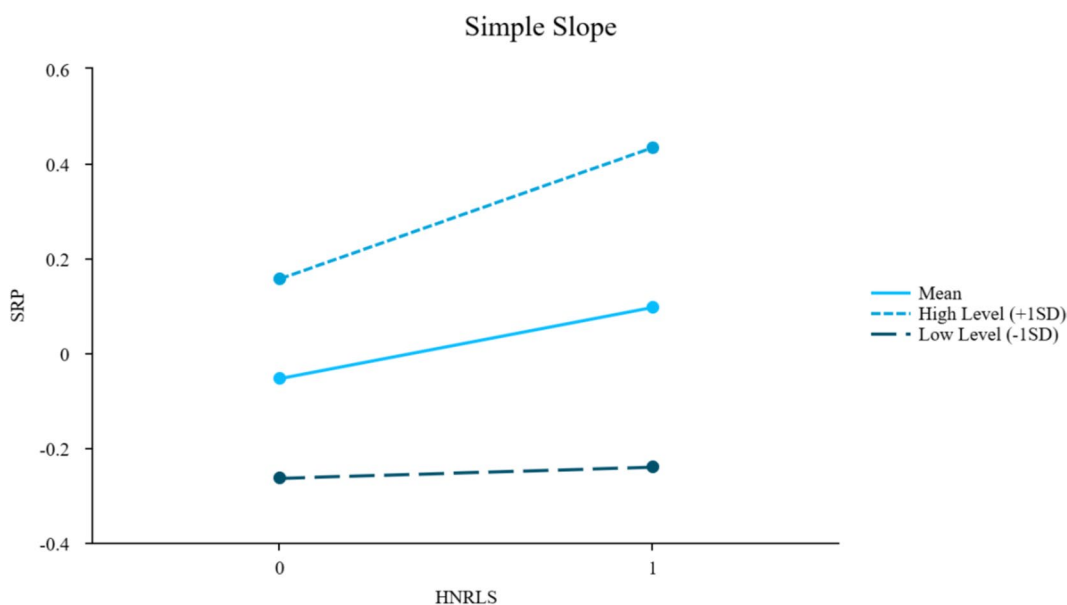
In this study, we found that the research leadership of the head nurse had a positive effect on the research performance of highly-educated nurses, which validated hypothesis 1 and was consistent with earlier reports [38, 39]. First, the head nurse had the right to arrange resources such as research shifts, manpower, research funds, and research training opportunities for nurses, which would greatly promote the scientific research performance of nurses. Besides, the head nurse with strong nursing research leadership was more likely to be equipped with sufficient research knowledge, skills, and experience to guide other nurses in research. What’s more important, nurses’ attitude towards nursing research would also become positive due to the importance that the head nurse attached to research activities, because nurses always carry out what their leaders expected [16]. Therefore, nursing research

**Table 5** Simple Slope Analysis (research leadership of head nurse → research performance)

research self-efficacy	Effect	SE	t	p	LLCI	ULCI
M-SD	-0.041	0.029	-1.382	0.167	-0.098	0.017
M	0.094	0.022	4.248	< 0.001	0.051	0.138
M+SD	0.229	0.030	7.687	< 0.001	0.171	0.287

LLCI Low limit of 95% confidence interval, ULCI Up limit of 95% confidence interval





**Fig. 3** The moderation effect of Research self-efficacy of nurses on the association between Research leadership of head nurse and Research performance of nurses

leadership of head nurses is an important requirement for promoting highly-educated nurses to exert their scientific research talents.

According to the results, research burnout was a mediator between the nursing research leadership of head nurses and the research performance of highly-educated nurses, which could be explained by the LMX and JD-R theory. Specially, the head nurse could establish a high-quality leader-member relationship with the highly-educated nurse because of high expectations for them, in which the head nurse will provide nurses with more resources, trust and autonomy in arranging matters. Meanwhile, highly-educated nurses might require specific support related to nursing research, including training, position, and opportunities [40]. Thus, the head nurse offer appropriate support from the material and psychological aspects for highly-educated nurses to meet their needs by implement research leadership, which was crucial in blocking the pressure source and reducing the burnout in nursing research. The beneficial effects of strong leadership on employee burnout were also confirmed in earlier

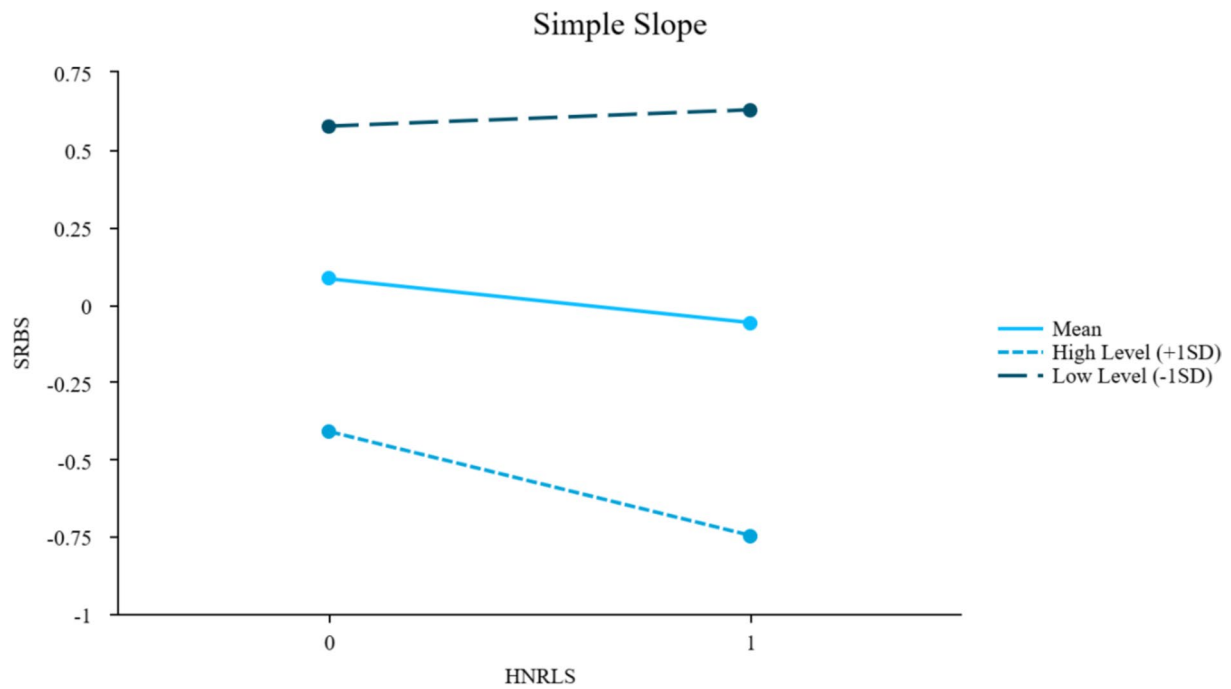
reports [41, 42]. According to JD-R, negative emotions would arise and job performance would be reduced when employees have insufficient resources to support them in meeting job requirements [18]. Thus, the highly-educated nurses could not meet the job requirements related to nursing research from the head nurse when they obtained insufficient resource and support in a low-quality relationship with their leaders, which led to the burnout and further reduced their performance about nursing research. Thus, head nurses should provide sufficient resources when formulating plans and shifts for nursing research to avoid burnout and ensure good research performance.

According to the results of the moderating analysis, the nursing research leadership of the head nurse could impact the nursing research performance directly and under the mediation of research burnout when the self-efficacy was at the median level. Likewise, the indirect effect of burnout disappeared when self-efficacy was at a high level. When self-efficacy was at a low level, leadership did not affect research performance. The association between self-efficacy and performance was reported in a previous study [43], but few researchers investigated its role in the relationship between research leadership and performance. In this study, research self-efficacy was proven to be a prerequisite for effective research leadership. In other words, it was likely that the expected research performance would not be achieved if the nurses had low self-efficacy. This finding would motivate nursing leaders to improve the research self-efficacy of highly educated nurses before implementing research leadership.

**Table 6** Simple Slope Analysis (research leadership of head nurse → research burnout → research performance)

research self-efficacy	Effect	Boot SE	Boot LLCI	Boot ULCI
M-SD	-0.004	0.009	-0.021	0.012
M	0.010	0.004	0.004	0.018
M+SD	-0.031	0.010	-0.051	-0.012

LLCI Low limit of 95% confidence interval, ULCI Up limit of 95% confidence interval

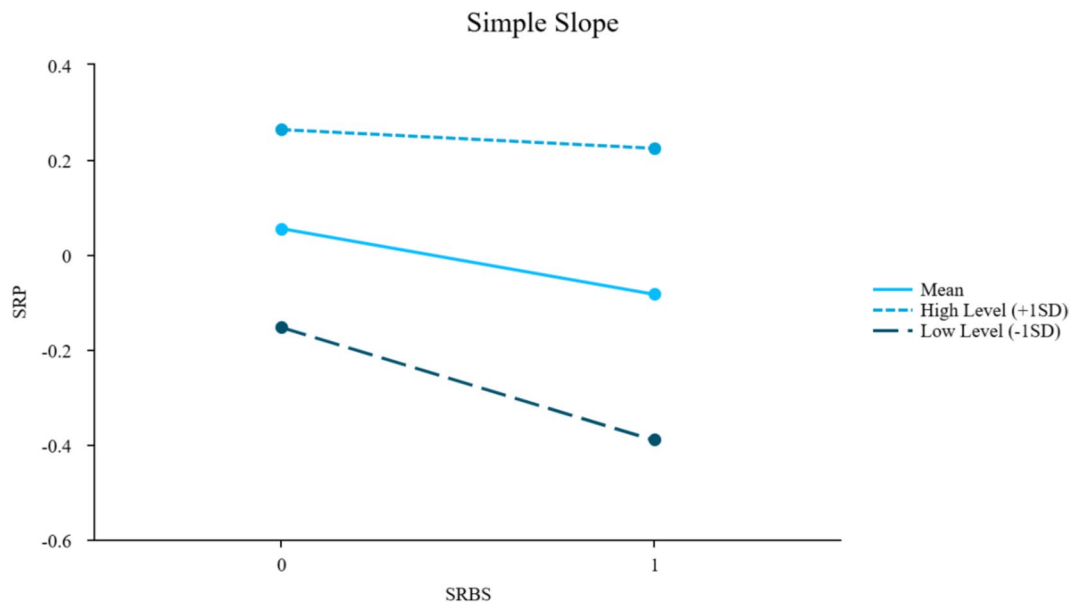


**Fig. 4** The moderation effect of Research self-efficacy of nurses on the association between Research leadership of head nurse and Research burnout of nurses

**Limitations**

There were some limitations in this study, such that the causal relationship between various variables could not be determined because of the cross-sectional study design. Hence, experimental and longitudinal research could be used to further explore the causal relationships

of the different variables in future studies. Besides, the limitations on the accuracy, subjectivity, and memory bias of self-reports might reduce the reliability of this study. Finally, some common sociodemographic data were analyzed as control variables in this study, but some other variables that may have an impact on the results



**Fig. 5** The moderation effect of Research self-efficacy of nurses on the association between Research burnout of nurses and Research performance of nurses

may have been overlooked. Therefore, more similar studies are needed to further validate the stability of the conclusions of this study.

## Conclusions

According to this study, we conclude that the head nurses should receive academic training, which should enable them to understand better and support the research efforts of academically trained nurses. Additionally, the academic training of nurses should prepare them for situations in which head nurses do not understand and support their research efforts by promoting their self-efficacy.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-024-06457-0>.

Supplementary Material 1.

Supplementary Material 2.

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## Authors' contributions

GYL and MKK greatly contributed to conception and design, or analysis and interpretation of data. CTY, FWF, DXF, YCX, WM, GHH, and LPH contributed to data acquisition. GYL and MKK drafted the article and revised it critically for important intellectual content. CTY greatly contributed in the first round of revision of manuscript.

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## Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

This study has the approval of the Ethics Review Committee of life sciences in the First Affiliated Hospital of Zhengzhou University (2020-KS-HNSR071).

### Consent for publication

Each researcher agrees to the publication of this paper.

### Competing interests

The authors declare no competing interests.

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