The influence of the personality traits of newly graduated nurses on the knowledge, skills and professional self-efficacy in standardized training: a cross-sectional study

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Abstract

Background New graduate nurses often have certain potential safety hazards for patients due to insufficient knowledge and lack of clinical practice ability. To address these challenges, China has implemented a standardized training strategy. The improvements in the quality of this training involve not only the intervention of teaching methods but also the consideration of personality traits.

Methods The application software based on the BFI-2 Chinese scale was utilized to administer personality tests to nursing students; nursing students were invited to scan the QR code and voluntarily fill in a questionnaire, including basic information, personality test results, and a professional self-efficacy test scale; offline paper-based theoretical examination results of nursing students were collected before and after training. The data was then analyzed using SPSS software version 26.0, which involved descriptive analysis, one-way between-groups analysis of variance (ANOVA) and Spearman correlation analysis.

Results Based on the data, there were no observable differences in the theoretical results before and after training across different personality traits. In terms of skill assessment, conscientiousness exhibited the highest score at 78.91 ± 2.98 points, while negative emotionality showed the lowest score at 74.59 ± 2.12 points. These differences between different personality traits are statistically significant ($P < 0.001$). In terms of professional self-efficacy, conscientiousness scored the highest at 98.48 ± 12.69, while negative emotionality scored the lowest at 85.89 ± 11.71, with significant differences between different personality traits ($P < 0.001$). Professional self-efficacy was negatively correlated with agreeableness ($r = -0.150, P = 0.044$) and positively correlated with conscientiousness ($r = -0.310, P < 0.001$). Skill scores were negatively correlated with negative emotionality ($r = -0.257, P < 0.001$) and positively correlated with conscientiousness ($r = 0.182, P = 0.014$).

Conclusions This study shows that personality traits affect the skills test results and professional self-efficacy of nursing students. Conscientiousness scored the highest in this study, while negative emotionality scored the lowest. Therefore, personalized training plans are recommended to improve the quality of care for such nursing students and to further enhance patient safety.

Keywords Newly graduated nurses, Personality traits, Standardized training, Professional self-efficacy, Patient safety

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Background

Newly graduated nurses are essential human resources in nursing, but they may not be fully prepared for the job due to insufficient professional knowledge, clinical ability, communication ability, etc. [1, 2]. In a previous study, more than 5,000 newly graduated registered nurses (NGRN) were evaluated, and the results showed that only 23% of NGRN reached the entry-level [3], leading to certain patient safety hazards. The transition from being a newly graduated nurse to a clinical nurse is full of challenges. To ease the smooth transition of nursing students from school to clinical settings, the Office of the China Health and Family Planning Commission issued the *Standardized Training Program for Newly-Employed Nurse"in February 2016. S (Trial)*[4]. This program provides professional clinical training for newly graduated nurses to promote the formation of professional ethics, cultivate clinical thinking, and improve clinical practice ability [4]. This initiative is similar to The Flying Star (FSNHS) in the United Kingdom and the New Nurse Transition Program (NTP) in the United States [5, 6]. The training syllabus stipulates a 24-month department rotation training for nursing students, carry out real clinical practice under the guidance of the nurse teacher, and complete the clinical tasks arranged by the teacher. Departments including internal medicine, surgery, emergency department, obstetrics and gynecology/pediatrics/operation room, etc.. This comprehensive training covers relevant professional knowledge, skills and vocational quality training. After the training, students must experience a series of theoretical and skills assessments formulated by the state [7, 8].

Personality traits are stable characteristics with an individual's nature that can affect their emotional expression, behavioral traits and thinking patterns [9]. Based on McCrae and Costa's "Five-factor model" theory, personality traits are divided into negative emotionality, extraversion, open-mindedness, agreeableness and conscientiousness [10]. This theory has been widely used in medical research [11, 12]. Personality traits directly or indirectly affect all aspects of an individual, including personal abilities. Previous studies have proved the correlation between the performance of nursing students in clinical practice and their personality traits [13, 14]. In terms of personal ability, Okumura et al. believe that in the intensive care environment, agreeableness and extraversion have a positive impact on nursing ability, while negative emotionality has a negative impact [15]. In addition, some studies have indicated that negative emotionality is more likely to produce occupational stress or burnout, while other personality types exhibit greater resistance to stress or burnout [16]. Therefore, the Five-factor model serves as a useful indicator for investigating the relationship between different personalities, abilities and attitudes.

Self-efficacy is important for nursing students' enthusiasm and participation as it reflects an individual's belief in their ability to achieve specific goals. Individuals with a strong sense of self-efficacy often face challenges optimistically and tenaciously [17]. Previous studies have shown that nursing skills, communication skills and nursing processes can affect self-efficacy [18]. Professional self-efficacy is a specific confidence or belief in one's ability to complete career-related tasks or activities [19]. Those with a high sense of professional self-efficacy are often full of confidence in their careers, showing positive job-hunting behavior, which is conducive to workability. This also ensures the safety of patients and facilitates successful career decisions and employment. In the context of standardized training, professional self-efficacy is particularly important for nurses nearing the end of their training. At present, little research reports on factors influencing the personal ability and professional self-efficacy of nursing students.

It has not been reported in the literature whether personality characteristics can affect the knowledge, skills and professional self-efficacy of nursing students in clinical practice. Therefore, we have designed a study with two purposes. The primary one is to determine the impact of the personality traits of nursing students on their knowledge, skills and professional self-efficacy in standardized training. The secondary purpose is to incorporate personalized personality training into clinical practice to improve the nursing ability and medical safety of nursing students.

Methods

Setting and participants

The study is a descriptive cross-sectional conducted in a tertiary hospital in China. This study was conducted from July 2022 to June 2024. The inclusion criteria are as follows: (1) voluntary participation in this study; (2) nursing students with no prior work experience before standardized training; (3) promise to not withdraw from the training during the research period; and (4) completion of the questionnaire materials. The exclusion criteria are: (1) incomplete questionnaires; (2) previous work experience; and (3) withdrawal from training or research. The institute has a total of 231 trained nursing students who have completed four-year or three-year nursing education. After the first six-month standardized training phase, the participants received an explanation of the study and consented to complete the questionnaire (Fig. 1).
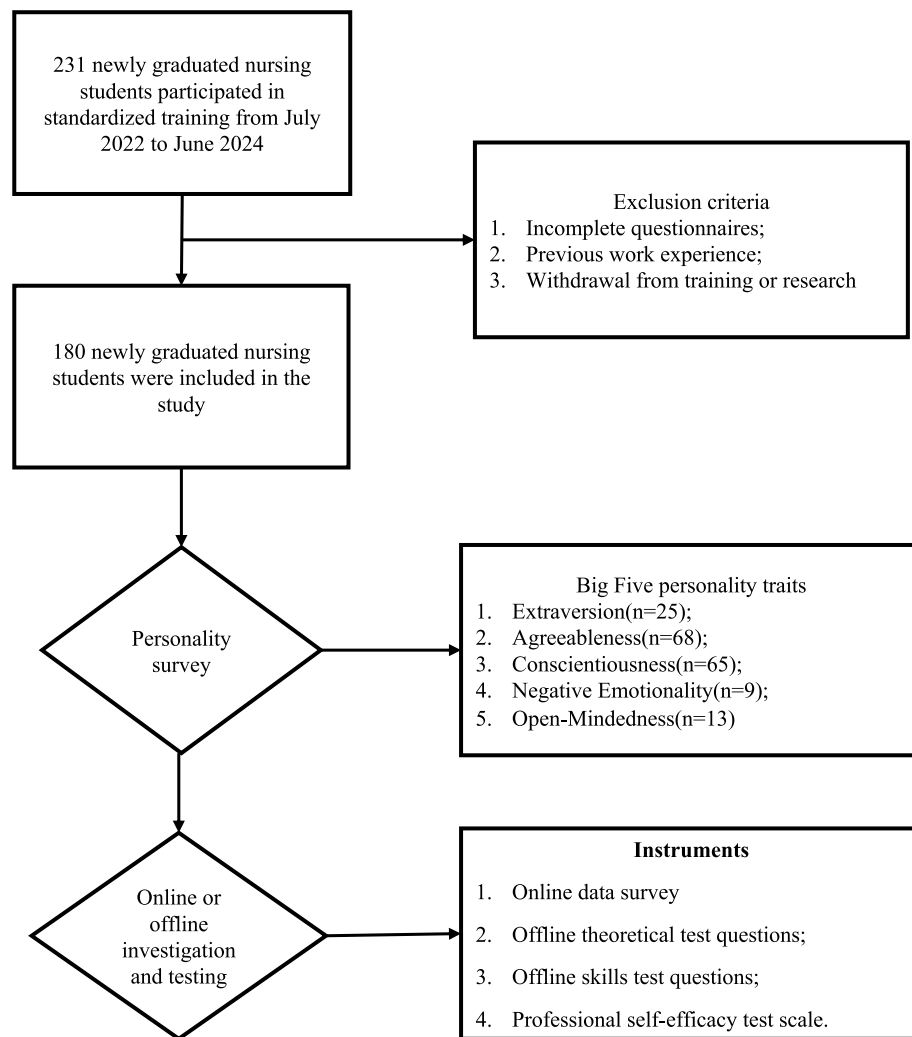
Fig. 1 Study Flowchart

Data collection

The data was collected from June to July 2024. It includes online questionnaires and offline paper reports, both approved for research before data collection. Online questionnaires were distributed via the online application platform, and the data of each nursing student can be obtained from the background after submission. Nursing students had the right not to participate in this survey or withdraw at any time without penalty, and their answers were kept confidential. They filled out the questionnaire by scanning a provided QR code and reading the informed consent form before filling it out. Submitting the complete questionnaire was deemed an agreement to participate in this study. The offline paper report consisted of a standardized examination organized by the department after training. Paper tests that covered both theoretical knowledge and practical skills were used.

Instruments

The tools used in this study include the Big Five Personality Test Table, offline theoretical test questions, offline skills test questions, and a professional self-efficacy test scale.

Personality measure

The personality test was conducted online using a smartphone application. The application administered a personality survey based on the BFI-2 Chinese scale [20]. There are a total of 60 items, each scored on a 5-point Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"). After completing the survey, the application automatically generated scores for the Big Five personality traits. These dimensions are: (1) Extraversion: characterized by enthusiasm, talkativeness, and vitality; (2) Agreeableness: characterized by caring for others, cooperation, and compassion;

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(3) Conscientiousness: characterized by being organized, reliable, and goal-oriented; (4) Negative Emotionality: characterized by mood swings, anxiety, and susceptibility to stress; (5) Open-Mindedness: characterized by curiosity, imagination and creativity. The highest-scoring personality dimension was regarded as the main personality trait of the nursing student and included in the study.

Knowledge test

All nursing students participating in the research will take an offline paper-based theory examination before and after the training. The examination questions are extracted by the hospital from the nursing public question bank, and primarily focus on the content of clinical practice. The test comprises a total of 50 multiple-choice questions, with a full score of 100.

Skills test

The Objective Structured Clinical Examination (OSCE) is used to objectively evaluate various clinical skills [21]. After the first stage of training, nursing students will undergo a skills assessment in the form of an OSCE, and the clinical-related scenarios will be simulated by Standardized Patients (SP), with the assessment divided into 4 parts, with a full score of 100 points) [22]: (1) pre-operation preparation (12 points); (2) operation process (60 points); (3) post-operation evaluation, including whether there are safety hazards in the operation, communication, proficiency, etc. (20 points); and (4) questions answered after the operation (8 points). The higher the score, the stronger the clinical abilities.

Professional self-efficacy test

The professional self-efficacy test scale was developed by Chinese scholar Hao in 2011 [23] to assess the belief and confidence of nursing students in the nursing major. The scale consists of 27 questions, each scored on a 5-point Likert scale, where indicate "strongly disagree" and 5 points indicate "strongly agree." The questions cover six dimensions: (1) professional attitude and belief; (2) information collection and planning ability; (3) problem-solving ability, (4) professional cognition; (5) professional values; and (6) professional choice. With a full score of 135, the higher the total score, the stronger the professional self-efficacy. The scale has a total Cronbach's α coefficient of 0.827, and the split-half reliability is 0.842.

Data analysis

SPSS (v26.0) software was used for descriptive analysis, comparison and correlation analysis. Continuous variables were expressed as mean ± standard deviation or median (quadruple range) and compared using one-way between-groups analysis of variance (ANOVA), independent sample t-test or Man-Whitney U test as appropriate. Categorical variables were represented as numbers (percentages) and compared using the Chi-square test or Fisher's exact test. Spearman correlation analysis was used to test the relationship between categorical and continuous variables. $P < 0.05$ was considered statistically significant. Data visualization was performed using GraphPad Prism (version 9.5.1) and Origin Pro 2024.

Ethical statements

This study was approved by the Ethics Committee of Leshan People's Hospital for evaluation and authorization (approval code: LYLL [2024] KY 063). Participants received written and oral descriptions of the research and were assured of their anonymity and confidentiality throughout the process. Participation was voluntary, and informed consent was obtained through the questionnaire, with the submission of a complete questionnaire being regarded as informed consent.

Results

Characteristics of the participants

Among all 231 nursing students, 180 newly graduated nurses were finally included in the research after the screening. The participants had an average age of 21.98 ± 1.49 years, with 25 (13.9%) men and 155 (86.1%) women. Among them, 156 (86.7%) said they voluntarily chose the nursing profession, while 24 (13.3%) stated they chose it involuntarily. Additionally, 168 (93.3%) said they were willing to engage in nursing work in the future, while 12 (6.7%) did not. A total of 138 (76.7%) graduated from the three-year nursing program, and 41 (22.8%) from the four-year nursing program. In terms of personality traits, 9 (5.0%) exhibited negative emotionality, 25 (13.9%) extraversion, 13 (7.2%), open-mindedness, 68 (37.8%) agreeableness, and 65 (36.1%) conscientiousness. Table 1 shows the baseline data description of five different personality traits. There are significant differences in willingness to choose a nursing major among different personality traits ($P = 0.041$), while there are no differences in gender, age, future career choices, and academic qualifications ($P > 0.05$).

Nursing student test scores

Table 2 shows the results of knowledge, skills and professional self-efficacy across different personality traits. In terms of initial theoretical score, open-mindedness scored the highest at 75.31 ± 8.26, and agreeableness scored the lowest at 73.00 ± 7.74, but there was no

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Table 1 Characteristics of the participants

Variable (N (%) or mean ± SD)	Negative Emotionality (n = 9)	Extraversion (n = 25)	Open-Mindedness (n = 13)	Agreeableness (n = 68)	Conscientiousness (n = 65)	P-Value
Sex						0.394
Men	1(11.1)	6(24.0)	1(7.7)	11(16.2)	6(9.2)	
Women	8(88.9)	19(76.0)	12(92.3)	57(83.8)	59(90.8)	
Age	22.56 ± 1.13	21.76 ± 1.36	21.46 ± 1.13	22.06 ± 1.42	21.97 ± 1.67	0.458
Professional choice						
Voluntarily	6(66.70	20(80.0)	9(69.2)	63(92.6)	58(89.2)	0.041
Involuntarily	2(33.3)	5(20.0)	4(30.8)	5(7.4)	7(10.8)	
Career choice						0.152
Nurse	7(77.8)	23(92.0)	11(84.6)	66(97.1)	61(93.8)	
Non-nurse	2(22.2)	2(8.0)	2(15.4)	2(2.9)	4(6.2)	
Academic background						0.427
Three-year major	7(77.8)	23(92.0)	10(76.9)	49(73.1)	49(75.4)	
Four-year major	2(22.2)	2(8.0)	3(23.1)	18(26.9)	16(24.6)	

Table 2 One-way between-groups analysis of variance and post hoc test of scores between different personalities

Evaluation indicators (mean ± SD)	1. Negative Emotionality (n = 9)	2. Extraversion (n = 25)	3. Open-Mindedness (n = 13)	4. Agreeableness (n = 68)	5. Conscientiousness (n = 65)	F	P-Value	LSD
Initial theoretical score	73.33 ± 9.55	73.52 ± 7.73	75.31 ± 8.26	73.00 ± 7.74	74.26 ± 7.67	0.363	0.834	
Theoretical score after training	88.47 ± 2.69	88.03 ± 2.09	87.60 ± 3.00	88.40 ± 2.89	87.77 ± 2.76	0.596	0.666	
Skills test	74.59 ± 2.12	78.17 ± 2.80	76.27 ± 5.07	78.07 ± 3.10	78.91 ± 2.98	4.948	< 0.001	2, 4, 5 > 1; 5 > 3
Professional self-efficacy test	85.89 ± 11.71	91.60 ± 11.58	87.54 ± 15.87	91.07 ± 10.11	98.48 ± 12.69	5.499	< 0.001	5 > 1, 2, 3, 4

significant difference in the results ($P = 0.834$). After six months of training, the theoretical score has improved significantly. Among them, negative emotionality had the highest score of 88.47 ± 2.69, and open-mindedness had the lowest of 87.60 ± 3.00, but there is no significant difference in the result ($P = 0.666$). In terms of skill assessment, conscientiousness scored the highest at 78.91 ± 2.98, and negative emotionality the lowest at 74.59 ± 2.12. The differences between different personality traits are significant ($P < 0\ 0.001$). After post hoc test, the results show that the scores for extraversion, agreeableness and conscientiousness were significantly higher than those of negative emotionality, and the score of conscientiousness is significantly higher than that of open-mindedness. In terms of professional self-efficacy, conscientiousness had the highest score at 98.48 ± 12.69, while negative emotionality had the lowest at 85.89 ± 11.71. The differences between different personality traits were significant ($P < 0.001$) (Fig. 2). After post hoc test, the results show that the score of conscientiousness was significantly higher than that for the other four types.

Correlation between the big five personality traits and scores

The relationship between the Big Five personality traits and knowledge, skills, and professional effectiveness is shown in Table 3. Among them, professional self-efficacy was negatively correlated with agreeableness ($r = -0.150$, $P = 0.044$) and positively correlated with conscientiousness ($r = -0.310$, $P < 0.001$). Skill scores were negatively correlated with negative emotionality ($r = -0.257$, $P < 0.001$) and positively correlated with conscientiousness ($r = 0.182$, $P = 0.014$). In terms of knowledge-related theoretical achievements, the five personality traits are not significantly correlated with the knowledge tests before and after training ($P > 0.05$) (Fig. 3).

Discussion

This study aims to determine the relationship between the personality traits of newly graduated nurses and their knowledge, skills and professional self-efficacy during standardized training. In China, standardized training is regarded as professional training that improves nursing education after graduation. This training provides
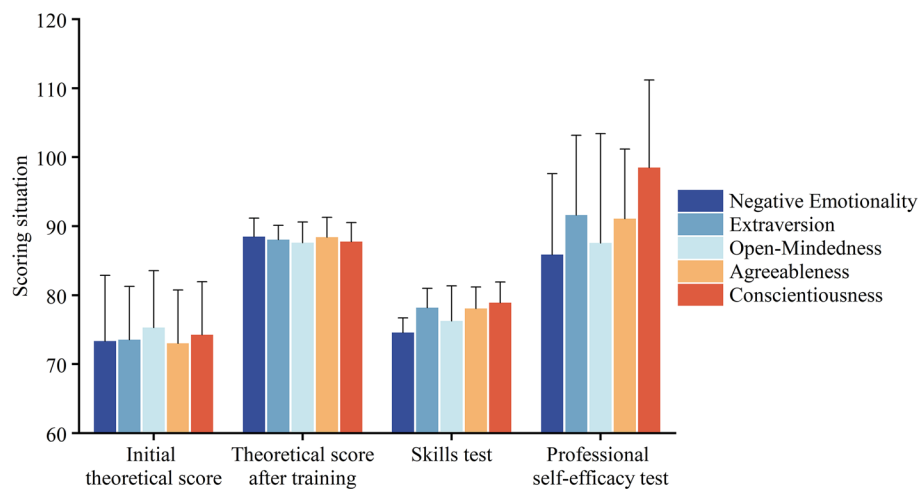
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Fig. 2 Comparison of different big five personalities in the test

Table 3 Correlation between the Big Five personality traits and scores

	1	2	3	4	5	6	7	8	9
1. Negative Emotionality, r/p	1								
2. Extraversion, r/p	-0.092/0.219	1							
3. Open-Mindedness, r/p	-0.064/0.393	-0.112/0.134	1						
4. Agreeableness, r/p	-0.179*/0.016	-0.313**/<0.01	-0.217**/0.003	1					
5. Conscientiousness, r/p	-0.172*/0.021	-0.302**/<0.001	-0.210**/0.005	-0.586**/<0.001	1				
6. Professional self-efficacy test, r/p	-0.136/0.068	-0.074/0.322	-0.08/0.288	-0.150*/0.044	0.310**/<0.001	1			
7. Initial theoretical score, r/p	-0.036/0.635	-0.012/0.874	0.059/0.434	-0.074/0.322	0.068/0.364	0.047/0.532	1		
8. Theoretical score after training, r/p	0.042/0.576	-0.017/0.816	-0.007/0.923	0.104/0.165	-0.107/0.151	-0.011/0.887	0.101/0.176	1	
9. Skills test, r/p	-0.257**/<0.001	0.004/0.959	-0.079/0.295	-0.026/0.731	0.182*/0.014	0.116/0.122	0.206**/0.005	0.122/0.104	1

*: At level 0.05 (two-tailed), the correlation was significant

**: At level 0.01 (two-tailed), the correlation was significant

knowledge and skill support for nursing students, and its quality affects the future quality of nursing work and patient safety[7]. The performance of theoretical knowledge and practical skills can reflect the personal ability and training quality of nursing students. Scholars have made efforts to improve the teaching quality of nursing students to promote patient safety. Fijačko[24] explored

the impact of a smartphone game on the basic life support theory and practical skills of nursing students. The results showed that the game could improve professional theoretical knowledge, though it had little effect on the improvement of skills. Uzun[25] taught creative drama after life-and-death care, which shows that this method was more effective and satisfying than traditional
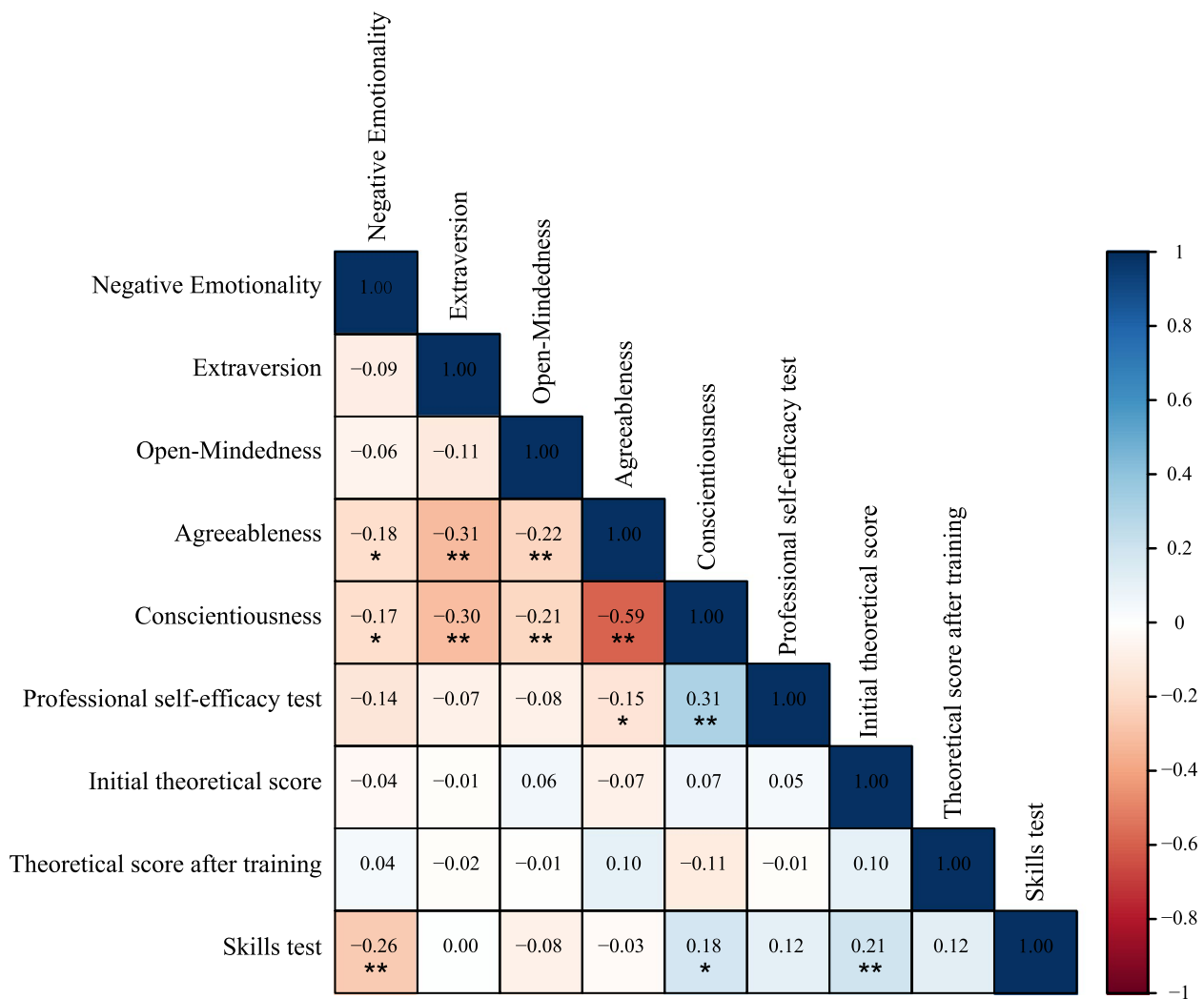
Fig. 3 Correlation between the Big Five personality traits and scores. *: At level 0.05 (two-tailed), the correlation was significant. **: At level 0.01 (two-tailed), the correlation was significant

education. In addition, task games, flip learning, simulation methods, etc., have been innovatively applied to nursing education with good results [26–28].

Methodological intervention mainly improves the quality of education through external environmental changes, but personal internal characteristics such as emotional intelligence, personality characteristics, etc., are equally important. Merino-Soto reveals that emotional intelligence plays an intermediary role between the academic performance of nursing students and academic burnout [29]. In terms of personality characteristics, a study on the relationship between the personality traits of nursing students and occupational adaptability, shows that Conscientiousness is positively correlated with career adaptability, while Negative Emotionality is negatively correlated [30]. In addition, some studies have shown that Open-Mindedness, Agreeableness and

Extraversion can positively affect the clinical practice ability of nursing[15]. Previous studies have demonstrated that personality traits are related to ability and attitude, so this study focuses on the role of different personality traits of nursing students in standardized training. The aim is to influence the development of future training programs. This study reveals that personality traits can significantly affect skills performance and professional self-efficacy in training. Specifically, in terms of skill operation, including the assessment of operation, communication and emergency response skills, it tests the comprehensive ability of nursing students. Extraversion, agreeableness and conscientiousness have better scores than negative emotionality, with conscientiousness scoring higher than open-mindedness. Among them, conscientiousness has the highest score (78.91 ± 2.98), which is in line with the

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description of conscientiousness in the Big Five Personality Test: the individual's sense of responsibility and self-discipline in work and life is shown as being organized, reliable, and goal-oriented. Negative emotionality has the lowest score (74.59 ± 2.12). According to the Big Five Personality Traits Test, individuals with negative emotionality are vulnerable to stress and mood swings. Nursing students, considered to be a high-pressure group [31] due to factors such as work pressure, patient pain and death, lack of professional knowledge and skills, emergencies, etc., may perform poorly if they have high negative emotionality. In other words, negative emotionality in clinical practice is more likely to cause potential safety hazards for patients, but no research has yet reported on the relationship between personality traits and medical safety. It is worth noting that whether before or after training, different personality traits do not affect theoretical knowledge.

In terms of professional self-efficacy, conscientiousness has the highest score (98.48 ± 12.69) significantly higher than other personality traits, indicating nursing students with high conscientiousness exhibit the strongest professional attitudes, problem-solving ability and professional cognition. This sense of self-efficacy can subconsciously motivate nursing students to overcome difficulties and handle pressure, which is important in clinical work. Studies have confirmed that nurses with strong professional self-efficacy can face the challenges of clinical work more confidently [32]. Although many studies have shown that professional self-efficacy has a significant correlation with work performance, Judge believes that personality traits play a certain intermediary role in the relationship between self-efficacy and work performance [33]. In this study, personality traits affect professional self-efficacy, with conscientiousness performing relatively well, which is in line with Zhang's conclusion that a proactive personality can affect career success [34]. In addition, Fukuzaki believes that responsible individuals can be more involved in their work [35]. In a study involving 596 nurses who had worked for 2 years, Tomita emphasized the importance of self-efficacy in improving nursing practice [36]. The essence of nursing education is patient safety. De Miguel proves that patient safety is related to nursing self-efficacy [37]. This is the most important significance of this study: it explores the potential impact of nurses on patient safety in the clinical environment, with personality as an intermediary. For those nurses with low professional self-efficacy scores, it is more likely to cause professional burnout. Therefore, when carrying out clinical teaching tasks, we should focus on this kind of nursing and actively carry out mindfulness training, so as to improve their learning status and mental health.

In the correlation analysis, the skill performance of nursing students is negatively related to negative emotionality and positively related to conscientiousness. Professional self-efficacy is negatively related to agreeableness and positively related to conscientiousness. This suggests that negative emotionality and agreeableness may have a direct or indirect negative impact on students' protective abilities. Previous studies have shown that negative emotionality is related to increased occupational stress and burnout[15, 16, 38]. Numerous studies have shown that negative emotionality plays a negative role in the profession, which is consistent with the conclusion of this study. It is worth noting that professional self-efficacy is negatively correlated with agreeableness, which is contrary to the conclusions of Wu and Lin [39, 40] This difference may be related to the sample size and the honesty of nursing students. Agreeableness is characterized by friendliness and humility, which lead to a gentle answer rather than an affirmative one, which may also have a certain impact on the research results.

In summary, personality will not affect the theoretical knowledge of nursing, but will affect nursing's clinical operation ability and professional self-efficacy. Conscientiousness stands out in this study. Nursing students with this personality can provide higher-quality care and reduce patient safety hazards. In contrast, negative emotionality deserves more attention due to its association with low skill scores and low professional self-efficacy. Based on the performance of different personality traits in skill operation and professional self-efficacy in this study, medical institutions should include personality tests in routine evaluation when formulating training plans for nursing care. Understand the different personality characteristics of each nurse through evaluation, and develop personalized training plans for different groups of people. For example, the nursing of Negative Emotionality can be included in the key training population, pay more attention, and increase the number of skills training to ensure that they can master the required abilities. In addition, in the process of clinical teaching, this kind of nursing can arrange experienced and good at communicating teachers to teach. In teaching, they pay more attention to the positive encouragement of nursing, pay attention to their emotional state, timely identify the generation of negative emotions, and carry out psychological intervention to reduce the impact of negative emotions on nursing training. These Awareness will ultimately be beneficial to clinical work and patient safety.

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Limitation

There are several limitations in our research. First of all, this study was conducted at a single center, which limits the generality of the research. The sample size, especially for nursing students with the personality traits of negative emotionality and open-mindedness, was small, making it necessary to expand the sample size or conduct multi-center research to further verify the conclusion. In addition, there were significant baseline differences among nursing students in their willingness to choose their majors ($P = 0.041$), although some groups had smaller sample sizes. However, we still chose to include these participants. In addition, studies have shown that personality traits can lead to different professional choices [41], which may explain these differences in our sample.

Conclusion

In this study, personality traits significantly influenced nursing students' skills test scores and professional self-efficacy. Conscientiousness scored higher in this study, while negative emotionality scored the lowest. Based on these findings, it is recommended to carry out personalized training plans to improve the quality of care provided by such nursing students and further contribute to patient safety.

Authors' contributions
J.Y designed and performed the research and wrote the paper; T.Y.M designed and performed the research and wrote the paper, and contributed equally as the first author. P.Y designed the research and supervised the report; J.Z performed the research and contributed to the analysis; M.Q.L performed the research and provided clinical advice; B.C designed the research and supervised the report.

Availability of data and materials
The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This study was approved by the Ethics Committee of Leshan People's Hospital for evaluation and authorization (approval code: LYLL [2024] KY 063). Participants received written and oral descriptions of the research and were assured of their anonymity and confidentiality throughout the process. Participation was voluntary, and informed consent was obtained through the questionnaire, with the submission of a complete questionnaire being regarded as informed consent.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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