The relationship between personality traits, metacognition and professional commitment in Chinese nursing students: a cross-sectional study

Jiaojiao Wang[1,2†], Yanchao Jiao[3†], Mengyun Peng[2†], Yanan Wang[2], Daoxia Guo[2*] and Li Tian[1,2*]

Abstract

Background Professional commitment of nursing students is closely related to the stability of the nursing team. Personality traits and metacognition may be related to professional commitment. We investigate the association between Big Five personality, metacognition, and professional commitment among nursing students, and further explore whether Big Five personality modifies the association between metacognition and professional commitment.

Methods From December 2023 to January 2024, a cross-sectional study was conducted among 3631 nursing students from 17 universities in China through the online platform Sojump.com by cluster sampling method and using the general information questionnaire, BFI-44 (Big Five Inventory 44) scale, metacognition scale and professional commitment scale to investigate their demographic data, personality traits, level of metacognition and level of professional commitment. Latent profile analysis was employed to identify optimal categories of personality traits. Multivariate logistic regression was used to analyze the association between the personality traits and professional commitment, as well as metacognition and professional commitment in all participants and participants with different personality traits subgroups, adjusting for potential covariates. Furthermore, the potential mediating role of metacognition between personality traits and professional commitment was also investigated.

Results Three distinct personality traits were identified: sensitive-negative personality (65.2%), ordinary personality (26.6%), and open-positive personality (8.2%). Compared with nursing students with sensitive-negative personality, nursing students with ordinary personality and open-positive personality were associated with professional commitment, respectively [OR (95% CI): 7.01 (5.99–8.20), 21.09 (15.43–28.83)]. The *p* value for trend of personality and professional commitment was < 0.001. Metacognition was associated with professional commitment [OR (95% CI): 5.95 (5.20–6.81); *p* < 0.001]. Personality traits could modify the association between metacognition and professional

†Jiaojiao Wang, Yanchao Jiao and Mengyun Peng contributed equally to this work.

*Correspondence:
Daoxia Guo
dxguo@suda.edu.cn
Li Tian
tianlisz@suda.edu.cn

Full list of author information is available at the end of the article

commitment ($p_{interaction}$ = 0.009). The mediating role of metacognition between Big Five personality and professional commitment has also been verified.

Conclusions Personality traits and metacognition of nursing students need to be paid attention to, and interventions based on metacognition may help nursing students with different personality traits to improve their professional commitment level.

Keywords Personality, Metacognition, Nursing, Professional commitment, Cross-sectional study

Introduction

Global healthcare systems are facing a significant challenge due to the persistent scarcity of nursing personnel, which is further exacerbated by the growing demand for nursing care. In order to achieve the Sustainable Development Goal 3 on health and well-being, it has been estimated by the World Health Organization that an additional 9 million nurses and midwives will be required worldwide by 2030 [1]. The concept of professional commitment is derived from organizational commitment, which is a perception formed after recognition of the goals and values of the organization. Nursing professional commitment pertains to the positive evaluation and acknowledgment of nurses' or nursing students' professional worth within the field of nursing, sense of duty towards work, inclination to engage in job-related activities, and aspiration for career advancement [2, 3]. Nursing students play a crucial role in ensuring the availability of skilled nursing professionals, significantly impacting the unity within nursing teams and advancements in nursing. A notable association exists between the level of professional commitment exhibited by nursing students and that demonstrated by registered nurses [4]. Moreover, the professional commitment of nurses is negatively correlated with turnover intention [5, 6]. Therefore, enhancing the professional commitment of nursing students holds significant importance to enhance the influx of newly registered nurses, retain skilled nursing professionals, and mitigate the scarcity of healthcare staff in the field.

 Based on the five-factor model, extraversion, agreeableness, conscientiousness, neuroticism, and openness are considered as the fundamental dimensions [7]. A study revealed that the students with better personality traits had higher professional commitment during the nursing period and after becoming nurses [4]. Neuroticism was negatively correlated with professional commitment of nursing students, while extraversion, openness, agreeableness and conscientiousness were significantly positively correlated with professional commitment [8]. Metacognition refers to the awareness of one's cognitive processes and the skill to regulate them [9]. For medical workers, job burnout is significantly negatively correlated with professional commitment [10]. College students' metacognition is a kind of ability to perceive, understand,

supervise, manage, and control their thinking process and cognitive activities [11]. Professional commitment is a predictor of learning burnout in clinical medical undergraduates [12]. A previous study has shown that excessive cognitive burden may lead to burnout [13], therefore, for medical staff and medical students, metacognition may be related to professional commitment. In addition, a previous study has shown that Big Five personality traits are related to metacognition in adolescent students, except neuroticism, which was negatively correlated with metacognitive scores, extraversion, openness, agreeableness, and conscientiousness were significantly positively correlated with metacognitive scores [14]. Therefore, there may be a correlation between big five personality traits, metacognition and professional commitment of nursing students. However, more research is needed to clarify the relationship among them. In addition, for nursing students, individual personality traits should be the combination of different personality traits. Therefore, latent profile analysis (LPA) can be used as a suitable method to identify and characterize individual unique personality traits.

 Therefore, we conducted an observational study to assess the categorization of Big Five personality traits among 3915 nursing students and investigate the association of personality traits and metacognition with professional commitment. We also examined the association of metacognition with professional commitment by personality trait subgroups. Additionally, we explored how metacognition acts as a mediator between Big Five personality traits and professional commitment. The ultimate goal is to enhance the level of professional commitment among nursing students thereby contributing towards the stability and reinforcement of the nursing team.

Materials and methods

Study design and participants

A cross-sectional design was used to collect data from December 2023 to January 2024. We recruited full-time nursing students from 17 schools in the eastern, central, and western regions of China, spanning across 7 provinces. Cluster sampling method was used in this study. The specific inclusion and exclusion criteria are as follows: Inclusion criteria: (i) full-time nursing students;

(ii) voluntarily participate in this study. Exclusion criteria: nursing students who (i) changed majors halfway; (ii) were on leave or rest during the survey. PASS 15 was used to calculate the sample size, with $\alpha = 0.05$, standard deviation of 14.72 according to the previous related study [15], and the confidence interval precision of 0.55. We calculated that 2752 participants were needed, considering 20% invalid questionnaires, and the final sample size was 3440. A total of 3,631 patients were ultimately included in this study. The study was conducted in accordance with the principles of the Declaration of Helsinki. The study was ethically approved by the Ethics Committee of Soochow University (SUDA20240502H01).

Demographic characteristics

A standardized questionnaire was employed to gather the participants' demographic information, encompassing age, gender, district, and satisfaction with clinical nursing experience, nation and grade. Before testing, informed consent was obtained from the school superintendent, then clear explanations and instructions of the questionnaire were provided to the nursing students, and an anonymous survey was used to request truthful responses from the nursing students, and informed consent was obtained from the participants.

Measurements of big five personality, metacognition, and professional commitment

We described the number of items for each dimension of Big Five personality, metacognition, and professional commitment, as well as the mean and total scores for each dimension. The composite scores for the study variables are shown in Supplementary Table 1.

This study used the professional commitment scale developed and revised by Lu, which is often used to examine the level of professional commitment of nurses and nursing students [16, 17]. The scale includes 3 dimensions: 9 items of willingness to make an effort, 8 items of maintaining membership, and 6 items of belief in goals and values. Each item was assessed on a Likert scale ranging from 1 (extremely uncertain) to 5 (pretty certain). The Cronbach's alpha coefficients of the scale was 0.908. The total score of professional commitment is the sum of the scores of the three dimensions, ranging from 23 to 115 (items 10–17 are reverse-coded). Higher score represents a higher level of professional commitment.

The Big Five Inventory was constructed in 1991 by psychologists from the University of California [18], and subsequently developed into a widely used personality model. The BFI-44 (Big Five Inventory 44) scale includes 44 items in 5 dimensions: extraversion (8 items), agreeableness (9 items), conscientiousness (9 items), neuroticism (8 items) and openness (10 items). Each item was evaluated on a five-point Likert scale ranging from 1

(strongly disagree) to 5 (strongly agree). A higher score on each dimension indicates a stronger tendency toward the corresponding personality trait. The Chinese-language BFI-44 was used to measure the personality traits of nursing students in this study [19]. The Cronbach's alpha coefficients of the scale was 0.946.

The questionnaire on the metacognition of students was used to assess nursing students' metacognition [11]. The scale contains 24 items across four dimensions: metacognitive planning (7 items), metacognitive monitoring (6 items), metacognitive regulating (6 items), and metacognitive evaluating (5 items). Participants were asked to rate each item on a 5-point Likert scale ranging from 1 (never) to 5 (always). Nursing students with higher scores demonstrate superior metacognition. The Cronbach's coefficient of the scale was 0.984.

Data collection

Data were collected using Sojump.com (Questionnaire Star, which is a professional online questionnaire survey, evaluation and voting platform). Nursing students were provided with the URL link to access the survey. The coinvestigators assessed participant eligibility and shared the survey link through WeChat, an instant messaging application in China. The online survey was structured into three parts: the initial section presented an overview of the study's goals, followed by a consent acquisition section, and finally, a survey administration section.

Statistical analysis

The data were analyzed using SAS 9.4, Mplus 8.3 and SPSS 26.0. Continuous variables were transformed into categorical variables, described as frequencies and percentages. LPA was used to identify personality traits in different categories, and fit indices were calculated separately from categories 1–6. The fitting indices used were Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), adjusted BIC (aBIC), Lo-Mendell-Rubin likelihood Test (LMRT), Bootstrapped Likelihood Ratio Test (BLRT) value, and entropy. Smaller AIC, BIC, and aBIC indicate a good fit, while entropy values greater than 0.8 indicate a classification accuracy of more than 90%. After selecting the best number of personality categories, the median was used to divide metacognition into low and high levels, and the tertiles were used to divide professional commitment into low, medium, and high levels. Multivariate logistic regression was used to analyze the association between the Big Five personality and professional commitment, as well as metacognition and professional commitment. Covariates in the adjusted model included sex, age, region, nation, grade, and satisfaction. The interaction between personality and metacognition was explored, followed by subgroup analysis with different personality traits. Pearson's correlation was

Table 1 Participants' demographic characteristics (*N* = 3631)

Characteristics	Categories	*n*	Percentage (%)
Age	15–18	926	25.5
	19–20	2020	55.6
	> 20	685	18.9
Gender	Male	582	16.0
	Female	3049	84.0
District	East	1349	37.1
	Middle and western	2282	62.9
Satisfaction	Discontented	174	4.8
	Uncertain	1964	54.1
	Contented	1493	41.1
Nation	Han	3439	94.7
	Minority	192	5.3
Grade	Freshman	1773	48.8
	Sophomore	976	26.9
	Junior	734	20.2
	Senior	148	4.1

used to analyze the relationship between two continuous variables (total or dimension score of each scale). To further explore the mediating effect of metacognition, Mplus 8.3 was utilized to conduct the Bootstrapping test (5000 times) to verify the mediating model of metacognition (continuous variables) on Big Five personality traits (continuous variables and categorical variables) and professional commitment (continuous variables) of nursing students. $p < 0.05$ (two-tailed) was considered statistically significant.

Results

Demographic characteristics

A total of 3915 questionnaires were collected in this study, out of which 3631 questionnaires were deemed valid. The achieved response rate was 92.7%. Most nursing students were female (84.0%), aged between 19 and 20 years (55.6%), freshman (48.8%), Han nationality (94.7%), from the central and western regions (62.9%), and were uncertain about clinical satisfaction (54.1%). The professional commitment scores of nursing students with demographic characteristics are shown in Table 1.

The association of big five personality and metacognition with professional commitment

The fitting indices of the six LPA models are shown in Supplementary Table 2. The three-profile model had smaller AIC, BIC, and aBIC values than the two-profile model and had significant *p* values for BLRT and LMR. Although the AIC, BIC, and aBIC values of the four-profile model were smaller than the three-profile model, the entropy value of the three-profile model was higher than that of the four-profile model. In addition, according to the parsimonious guideline, the three-profile solution was chosen as the final model. According to the characteristics of the model (Fig. 1), the subgroups were named as sensitive-negative personality (65.2%), ordinary personality (26.6%), and open-positive personality (8.2%).

In the model adjusted for gender, age, district, nation, grade, and satisfaction, compared with nursing students with sensitive-negative personality, the OR (95% CI) of general personality and professional commitment was 7.01 (5.99–8.20), and the OR (95% CI) of open-positive
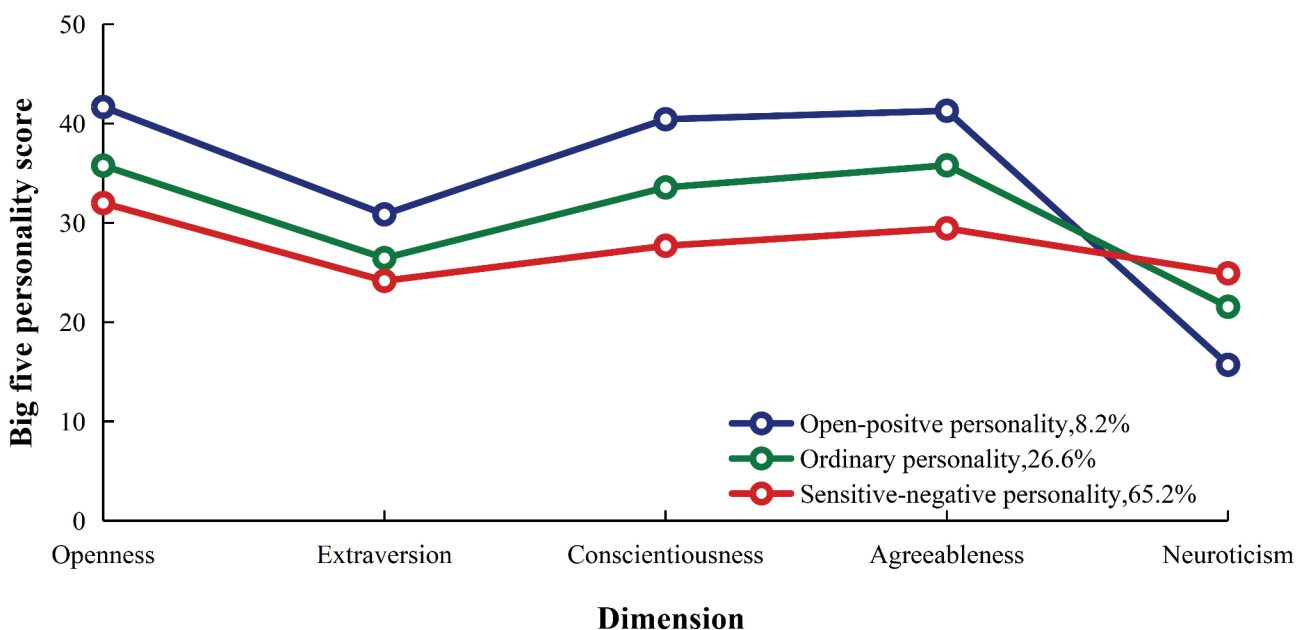

Fig. 1 Probability of scoring on BFI for three potential profiles of Big Five personality

Table 2 Association of personality traits and metacognitive ability with professional commitment of nursing students

	Model1	Model2
	OR (95% CI)	OR (95% CI)
Personality traits		
Sensitive-negative personality	ref	ref
Ordinary personality	7.00 (5.99–8.18)	7.01 (5.99–8.20)
Open-positive personality	21.17 (15.50-28.93)	21.09 (15.43–28.83)
p value for trend	<0.001	<0.001
Metacognition		
Low-level metacognition	ref	ref
High-level metacognition	5.62 (4.92–6.41)	5.95 (5.20–6.81)
p value	<0.001	<0.001

The big five personality traits were classified into 3 latent categories through latent profile analysis (LPA): sensitive-negative personality, ordinary personality, and open-positive personality;

Model1: unadjusted model;

Model2: adjusted for sex, age, district, nation, grade and satisfaction

OR, odds ratio; CI, confidence interval

Table 3 Association between metacognition and professional commitment by subgroup analysis with different personality traits

Metacognition	Model1	Model2
	OR (95% CI)	OR (95% CI)
Sensitive-negative personality		
Low-level metacognition	ref	ref
High-level metacognition	3.93 (3.34–4.64)	4.21 (3.55–4.98)
p value	<0.001	<0.001
Ordinary personality		
Low-level metacognition	ref	ref
High-level metacognition	2.82 (2.14–3.71)	2.91 (2.20–3.84)
p value	<0.001	<0.001
Open-positive personality		
Low-level metacognition	ref	ref
High-level metacognition	3.01 (1.15–7.90)	3.40 (1.25–9.22)
p value	0.025	0.016

The big five personality traits were classified into 3 latent categories through latent profile analysis (LPA): sensitive-negative personality, ordinary personality, and open-positive personality;

Model1: unadjusted model;

Model2: adjusted for sex, age, district, nation, grade and satisfaction

OR, odds ratio; CI, confidence interval

personality and professional commitment was 21.09 (15.43–28.83). The *p* value for trend between personality and professional commitment was <0.001. The adjusted OR (95% CI) of professional commitment with high metacognition compared with low metacognition was 5.95 (5.20–6.81) (Table 2). We also analyzed the association between Big Five personality and metacognition. Compared with nursing students with sensitive-negative personality, the adjusted OR (95% CI) of open-positive personality and metacognition was 24.85 (15.46–39.93).

The *p* value for trend between personality and metacognition was <0.001 (Supplementary Table 3).

The interaction of big five personality and metacognition on professional commitment

We found a significant interaction between Big Five personality and metacognition on professional commitment of nursing students ($p_{interaction}$ = 0.009). The results of subgroup analysis showed that in the adjusted model, the OR (95% CI) between metacognition and professional commitment of nursing students with sensitive-negative personality was the highest, which was 4.21 (3.55–4.98). The OR (95% CI) of metacognition and professional commitment of nursing students with ordinary personality was the lowest, which was 2.91 (2.20–3.84). The OR (95% CI) of metacognition and professional commitment of nursing students with open-positive personality was between the above two personality traits, which was 3.40 (1.25–9.22) (Table 3).

The mediating role of metacognition between big five personality and professional commitment

This study analyzed the correlation between Big Five personality traits, metacognition, and professional commitment. The Pearson correlation coefficients among all variables are shown in Supplementary Table 4. The results showed that openness, extraversion, conscientiousness, and agreeableness were positively correlated with metacognition and professional commitment (all *p* <0.001). Neuroticism was negatively correlated with metacognition and professional commitment (*p* <0.001). Metacognition was positively correlated with professional commitment (*p* <0.001). We found no significant collinearity between the five personality traits, total metacognition scores, and total professional commitment scores (variance inflation <10).

We investigated the mediating effect of metacognition between Big Five personality traits (continuous variables and categorical variables) and professional commitment. The Bootstrap method was used to estimate the interval of mediating effect, the 95% CIs of the effect of metacognition on professional commitment were all excluding 0 (Supplementary Table 5). This indicates that Big five personality traits and personality traits categories can not only predict professional commitment directly, but also predict professional commitment through the mediating effect of metacognition. The percentage of direct and indirect effects in the total effect has been indicated. Therefore, a model that uses metacognition as a mediator to establish connections has a mediating effect.

The mediating effect model of Big Five personality and professional commitment is shown in Fig. 2a and e. Openness (β=0.595, *p* <0.001), extraversion (β=0.422, *p* <0.001), conscientiousness (β=0.507, *p* <0.001), and
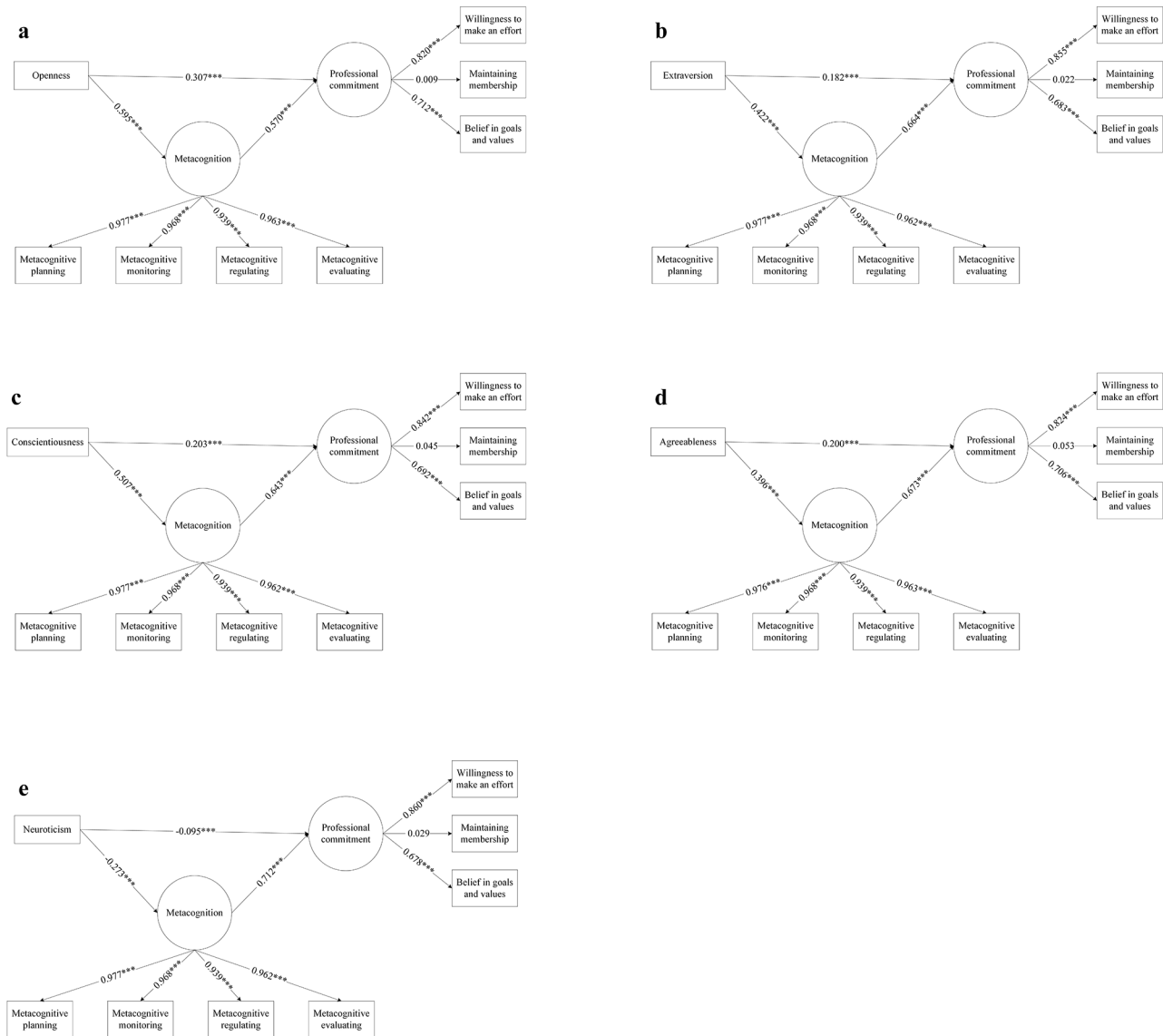
Fig. 2 Mediating effect of metacognition between Big Five personality (continuous variables) and professional commitment

agreeableness (β=0.396, p<0.001) significantly and positively predicted metacognition. Neuroticism significantly and negatively predicted metacognition (β = -0.273, p<0.001). When Big Five personality traits and metacognition entered the equation at the same time to predict professional commitment, openness (β=0.307, p<0.001), extraversion (β=0.182, p<0.001), conscientiousness (β=0.203, p<0.001), agreeableness (β=0.200, p<0.001) and metacognition significantly and positively predicted professional commitment, neuroticism significantly negatively predicted professional commitment (β = -0.095, p<0.001).

We further investigated the mediating effect of metacognition on the relationship between personality trait categories and professional commitment. Two dummy variables (ordinary personality and open-positive

personality) were created by using indicator coding to represent the three personality profiles. The sensitive-negative personality profile served as a reference group. Nursing students with ordinary personality had 0.278 times greater metacognition than those with sensitive-negative personality (a_1=0.278), and the level of professional commitment also increased by 0.662 (b=0.662) with metacognition. The relative direct effect of ordinary personality was significant (c'_1 = 0.091, p<0.001), which indicated that professional commitment in nursing students with ordinary personality was 0.091 times higher than that of students with sensitive-negative personality. Similarly, the metacognition of nursing students with open-positive personality was 0.411 times higher than that of nursing students with sensitive-negative personality (a_2=0.411), and the level of professional commitment

also increased by 0.662 times with the improvement of metacognition (b=0.662). The relative direct effect of open-positive personality was significant (c'$_2$ = 0.180, p<0.001), which indicated that professional commitment in nursing students with open-positive personality was 0.180 times higher than that of nursing students with sensitive-negative personality (Fig. 3).

Discussion

In this large cross-sectional study, the Big Five personality traits of the included 3631 nursing students can be classified into three latent categories through LPA, i.e., sensitive-negative personality, ordinary personality, and open-positive personality. We found that the personality traits and metacognition were associated with professional commitment, respectively. Moreover, personality traits could modify the association between metacognition and professional commitment. Additionally, the metacognition serves as a mediating factor between the Big Five personality traits and professional commitment.

We analyzed the levels of Big Five personality, metacognition and professional commitment among nursing students. In this study, the highest level of the five personality traits among nursing students was agreeableness, and the lowest was neuroticism, which was consistent with the study by Xu et al. [20]. However, in two studies from Israel and Malaysia, nursing students

had the highest level of agreeableness and the lowest level of extraversion [21, 22]. This could be attributed to the diverse cultural contexts and individual attributes of students across various nations. In this study, the metacognition of nursing students is at a medium level, but higher than that of five-year higher vocational college nursing students and second and third grade nursing students [23, 24], which suggests that the metacognition of nursing students may be related to the cultural quality and educational level of nursing students. The level of professional commitment of nursing students in this study was at a moderate level, slightly higher than that of Zhang et al. 's study [15]. This may be due to the fact that the study by Zhang et al. included nursing students during their internship, and these students may have been under greater stress, resulting in lower professional commitment [25]. However, the level of professional commitment of nursing students in this study was slightly lower than Cheng et al.'s study [26] may be due to the fact that the nursing students included in this study experienced the COVID-19 pandemic, which led to increased negative emotions of students towards nursing, increased anxiety, and unwillingness to engage in nursing work in the future [27, 28].

Fewer previous studies on Big Five personality traits have considered potential differences in variables between individuals. Therefore, to better explore the
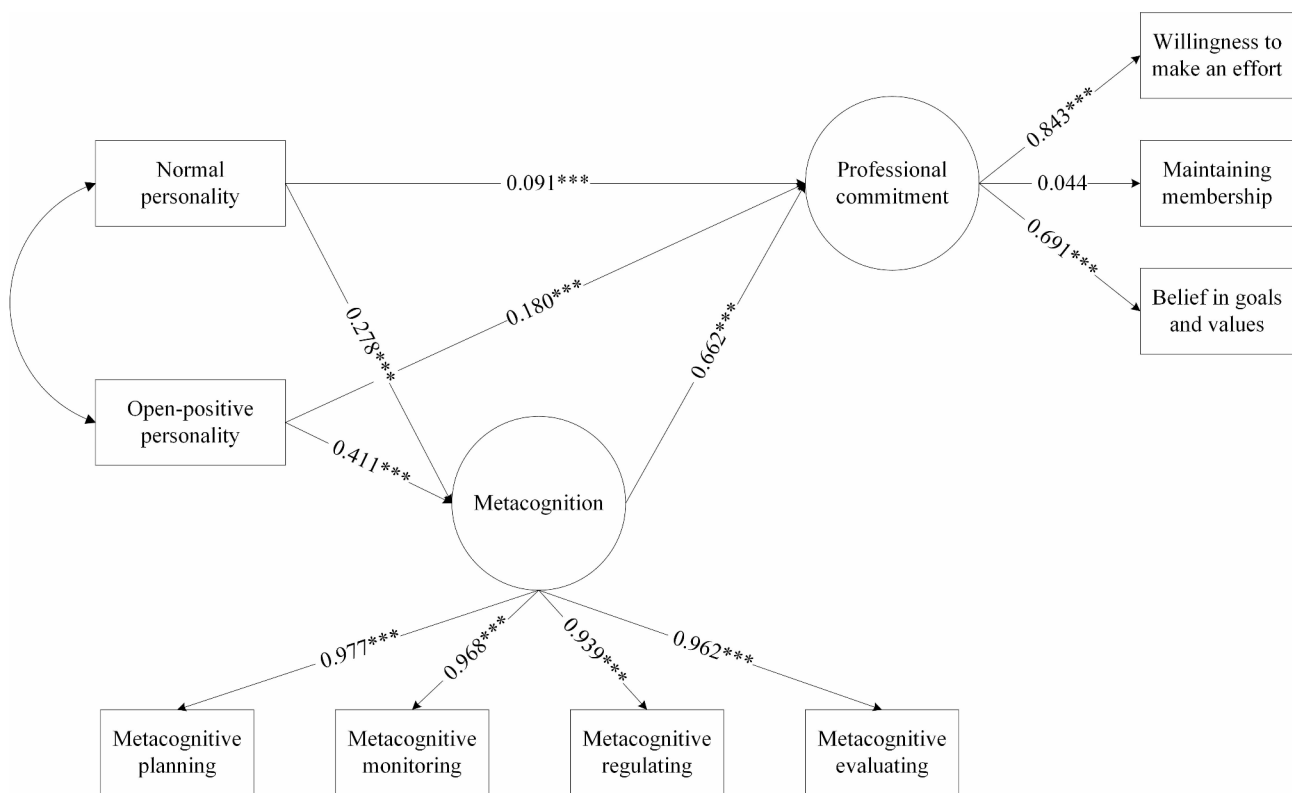

Fig. 3 Mediating effect of metacognition between Big Five personality (categorical variables) and professional commitment

heterogeneity of Big Five personality, this study explored potential categories of personality traits among nursing students. We found that Big Five personality traits were classified into three latent categories through LPA. The Big Five personality traits of nursing students were divided into normal personality, open-positive personality, and sensitive-negative personality, which is similar to the results of Huang et al. 's study on Chinese nurses [29], that is, more than 60% of the subjects were negative types. Nursing students with sensitive-negative personalities have higher levels of neuroticism and lower levels of openness, extraversion, agreeableness and conscientiousness. This kind of nursing students tend to produce more negative emotions, so they need more attention.

This study found a specific association between Big Five personality, metacognition, professional commitment, and the interaction between personality traits categories and metacognition. Subsequently, we found that the association between metacognition and professional commitment existed in the three personality categories, and this relationship was the strongest in sensitive-negative personality group. While the personality traits of nursing students have been clearly defined, we generally have difficulty in effective interventions for stable personality traits. Therefore, improving metacognition may be an effective way to improve professional commitment levels.

Although personality traits play an important role in professional commitment, few studies have investigated the mediating mechanism of Big Five personality traits on professional commitment. To further explore the role of metacognition in the relationship between Big Five personality and professional commitment, we proposed a mediation model to reveal the relationships between Big Five personality traits, metacognition, and professional commitment. Mediation analysis showed that metacognition mediated the relationship between Big Five personality traits and professional commitment. In this study, openness, extraversion, conscientiousness, and agreeableness were positively correlated with professional commitment, and neuroticism was negatively correlated with professional commitment, the same as the results of a previous study [4]. Metacognition mediated relationship between personality traits (continuous and categorical variables) and professional commitment. Therefore, the professional commitment level of nursing students can be improved by improving their metacognition level, especially for nursing students with sensitive-negative personality.

High metacognition tends to represent higher creative thinking, divergent thinking and convergent thinking [30]. Moreover, metacognition can improve the problem-solving ability of medical students [31]. In addition, previous studies have shown that metacognition is related

to the self-efficacy of nursing students [24], while self-efficacy is positively related to professional commitment among first-year nursing students [32]. These findings suggest a potential correlation between metacognition and professional commitment, which aligns with the outcomes of our study. Therefore, the Big Five personality test should be applied to nursing students. After the test, we should pay attention to the metacognition level of nursing students. If nursing students have sensitive-negative personality and low metacognition level, it is essential to strengthen the cultivation and improvement of their metacognition. This study provides a roadmap for enhancing the professional commitment of nursing students as a reference for educators and policy makers. A systematic review suggested that approaches to improving metacognition include clinical practice diary e-portfolios, reflective clinical logs, problem-based learning, simulation-based learning, and conceptual teaching methods performed by students themselves as well as instructors' course plans [33]. These methods provide opportunities for students to self-evaluate and self-monitor, improve their critical thinking and problem-solving skills, and thus improve students' metacognition. However, further exploration is needed on how to enhance the level of metacognition of nursing students effectively.

Limitations: Several limitations need to be acknowledged in this study. Firstly, it is essential to note that this study adopts a cross-sectional design, which restricts its ability to establish causality and identify changes in variables over time. In the future, prospective studies should be carried out to track the future career situation of nursing students in order to further explore the causal relationship. In addition, the sample used in this study consists of nursing students from China, potentially introducing variations when compared to Western countries. Differences in cultural background, education system and social environment may lead to differences in behaviors, attitudes and responses from students in Western countries, which may affect the external validity of the study results and limit its popularization and application in different cultural and educational backgrounds. Therefore, caution should be exercised when generalizing the findings of this study. Nursing students from different cultural backgrounds and countries should be included in future research to reduce the influence of cultural and educational background on research results through multi-center research.

Conclusion
Personality traits and metacognition are related to professional commitment of nursing students. Metacognition can act as a powerful buffer against a sensitive-negative personality and a boost to a open-positive personality, thereby improving professional commitment. School

Wang *et al. BMC Nursing*   (2024) 23:729

Page 9 of 10

departments should focus on identifying differences in personality traits and metacognition among nursing students, particularly those with sensitive-negative personalities. By improving their metacognitive skills, schools can increase their commitment to the nursing profession and help address the shortage of healthcare workers.

Abbreviations

aBIC	Adjusted Bayesian Information Criterion
AIC	Akaike Information Criterion
BFI-44	Big Five Inventory 44
BLRT	Bootstrapped Likelihood Ratio Test
BIC	Bayesian Information Criterion
LMRT	Lo-Mendell-Rubin likelihood Test
LPA	Latent Profile Analysis

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12912-024-02399-6.

Supplementary Material 1

Data availability
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Ethics approval was obtained from the Ethics Committee of Soochow University (SUDA20240502H01) where the researchers work. Consent was embedded at the beginning of the online questionnaire and participants were prompted to withdraw at any time. Participants completed and submitted the electronic questionnaire indicating that their informed consent had been obtained.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]The First Affiliated Hospital of Soochow University, Suzhou 215006, China
[2]School of Nursing, Soochow University, No.1 Shizi Street, Suzhou 215006, China
[3]Taishan vocational college of nursing, Taian 271000, China

References

1. *World Health Organisation. Nursing and midwifery*. Retrieved 2022-03-18 from https://www.who.int/news-room/fact-sheets/detail/nursing-and-midwifery
2. Jafaragaee F, Parvizy S, Mehrdad N, Rafii F. Concept analysis of professional commitment in Iranian nurses. Iran J Nurs Midwifery Res. 2012;17(7):472–9.
3. Jafaraghaee F, Mehrdad N, Parvizy S. Influencing factors on professional commitment in Iranian nurses: a qualitative study. Iran J Nurs Midwifery Res. 2014;19(3):301–8.
4. Lu KY, Chiou SL, Chang YY. A study of the professional commitment changes from nursing students to registered nurses. Kaohsiung J Med Sci. 2000;16(1):39–46.
5. Chang HY, Lee IC, Chu TL, Liu YC, Liao YN, Teng CI. The role of professional commitment in improving nurses' professional capabilities and reducing their intention to leave: two-wave surveys. J Adv Nurs. 2019;75(9):1889–901. https://doi.org/10.1111/jan.13969.
6. Lu KY, Pan SM, Lee LL, Shia LY, Chang YY. The influence of professional commitment on turnover intention. Kaohsiung J Med Sci. 2001;17(7):364–71.
7. McCrae RR, John OP. An introduction to the five-factor model and its applications. J Pers. 1992;60(2):175–215. https://doi.org/10.1111/j.1467-6494.1992.tb00970.x.
8. Guangchong Z. (2016). *Study on the Social Psychological Factors of Nursing Professional Commitment of Student Nurse——Take Zhengzhou University Of Industrial Technology for example* Zhengzhou University].
9. Fleur DS, Bredeweg B, van den Bos W. Metacognition: ideas and insights from neuro- and educational sciences. NPJ Sci Learn. 2021;6(1):13. https://doi.org/10.1038/s41539-021-00089-5.
10. Liu LR, Li CJ, Long YF, Zhan CL. [Effect of occupational commitment on job burnout of traditional Chinese medicine doctors]. Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi. 2009;27(3):145–8.
11. Kang Z. The Preliminary Construction of the Scale for College Student's Metacognitive Ability. Shanxi University]; 2005.
12. Yu S, Li W, Yu H, Ju X, Ling C. The relationship between learning burnout, professional commitment, and psychological capital in undergraduate clinical medical students. Med (Baltim). 2023;102(37):e35207. https://doi.org/10.1097/md.0000000000035207.
13. Iskander M. Burnout, cognitive overload, and Metacognition in Medicine. Med Sci Educ. 2019;29(1):325–8. https://doi.org/10.1007/s40670-018-00654-5.
14. Nie Y, Yang A, Zeng M. The relationship among adolescents' Meta-cognition, big five personality and academic adaptive behavior. Psychol Dev Educ. 2011;27(2):151–7.
15. Zhang J, Ren X, Lai F, Chen J, Shan S, Tian L. Professional commitment and related factors among nursing undergraduates: a latent profile analysis. Nurse Educ Today. 2023;131:105958. https://doi.org/10.1016/j.nedt.2023.105958.
16. Lu KY, Lin PL, Wu CM, Hsieh YL, Chang YY. The relationships among turnover intentions, professional commitment, and job satisfaction of hospital nurses. J Prof Nurs. 2002;18(4):214–9. https://doi.org/10.1053/jpnu.2002.127573.
17. Lu KY, Chang LC, Wu HL. Relationships between professional commitment, job satisfaction, and work stress in public health nurses in Taiwan. J Prof Nurs. 2007;23(2):110–6. https://doi.org/10.1016/j.profnurs.2006.06.005.
18. John OP, Donahue EM, Kentle RL. The big five inventory–versions 4a and 54. Berkeley, CA: University of California,Berkeley, Institute of Personality and Social Research; 1991.
19. Li H, Xu J, Chen J, Fan y. A reliability Meta-analysis for 44 items big five inventory: based on the reliability generalization methodology. Adv Psychol Sci. 2015;23(5):755–65.
20. Xu Q, Li D, Dong Y, Wu Y, Cao H, Zhang F, Xia Y, Chen J, Wang X. The relationship between personality traits and clinical Decision-Making, anxiety and stress among intern nursing students during COVID-19: a cross-sectional study. Psychol Res Behav Manag. 2023;16:57–69. https://doi.org/10.2147/prbm.S387682.
21. Avrech Bar M, Katz Leurer M, Warshawski S, Itzhaki M. The role of personal resilience and personality traits of healthcare students on their attitudes towards interprofessional collaboration. Nurse Educ Today. 2018;61:36–42. https://doi.org/10.1016/j.nedt.2017.11.005.
22. Mohamed Z, Singh J, Dediwadon GK, Mohamad Saleh NS, Jupri NA, N. N., Ganesan Y. Adult personality and its relationship with stress level, coping mechanism and academic performance among undergraduate nursing students. Malays J Med Sci. 2022;29(5):117–25. https://doi.org/10.21315/mjms2022.29.5.12.
23. Jin M, Ji C. The correlation of metacognitive ability, self-directed learning ability and critical thinking in nursing students: a cross-sectional study. Nurs Open. 2021;8(2):936–45. https://doi.org/10.1002/nop2.702.

24. Chen JH, Björkman A, Zou JH, Engström M. Self-regulated learning ability, metacognitive ability, and general self-efficacy in a sample of nursing students: a cross-sectional and correlational study. Nurse Educ Pract. 2019;37:15–21. https://doi.org/10.1016/j.nepr.2019.04.014.

25. Zhao L, Su Y, Jiang N, Zhou F, Liao L, Liu Y. Changes in professional commitment of undergraduate nurse students before and after internship: a longitudinal study. BMC Med Educ. 2022;22(1):282. https://doi.org/10.1186/s12909-022-03364-0.

26. Cheng L, Chen Q, Zhang F. Mediating effects of meaning in life on the relationship between general self-efficacy and nursing professional commitment in nursing students: a structural equation modeling approach. Med (Baltim). 2021;100(29):e26754. https://doi.org/10.1097/md.0000000000026754.

27. Manzanares I, Sevilla Guerra S, Lombraña Mencía M, Acar-Denizli N, Salmerón M, J., Estalella M, G. Impact of the COVID-19 pandemic on stress, resilience and depression in health professionals: a cross-sectional study. Int Nurs Rev. 2021;68(4):461–70. https://doi.org/10.1111/inr.12693.

28. Song M, Zhang L, Ji Q, Ji P, Xu J, Chen Y, Guo L. Nursing students' emotions, educational concerns, and the impact of study careers and professional futures during the COVID-19 pandemic: a cross-sectional study. BMC Med Educ. 2024;24(1):278. https://doi.org/10.1186/s12909-024-05231-6.

29. Huang W, Cai S, Zhou Y, Huang J, Sun X, Su Y, Dai M, Lan Y. Personality profiles and personal factors Associated with psychological distress in Chinese nurses. Psychol Res Behav Manag. 2021;14:1567–79. https://doi.org/10.2147/prbm.S329036.

30. Jiang L, Yang C, Pi Z, Li Y, Liu S, Yi X. Individuals with high Metacognitive ability are better at Divergent and Convergent thinking. J Intell. 2023;11(8). https://doi.org/10.3390/jintelligence11080162.

31. Safari Y, Meskini H. The Effect of Metacognitive instruction on Problem solving skills in Iranian students of Health sciences. Glob J Health Sci. 2015;8(1):150–6. https://doi.org/10.5539/gjhs.v8n1p150.

32. Mei XX, Wang HY, Wu XN, Wu JY, Lu YZ, Ye ZJ. Self-Efficacy and Professional Identity among freshmen nursing students: a latent Profile and Moderated Mediation Analysis. Front Psychol. 2022;13:779986. https://doi.org/10.3389/fpsyg.2022.779986.

33. Medina MS, Castleberry AN, Persky AM. Strategies for Improving Learner Metacognition in Health Professional Education. Am J Pharm Educ. 2017;81(4):78. https://doi.org/10.5688/ajpe81478.

Publisher's note