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Sense of responsibility mediates proactive personality and prosocial behavior in nursing undergraduates: a cross-sectional study

Yuling Jia[1*†] and Yuexue Yue[1*†]

Abstract

Background The prosocial behavior of undergraduate nursing students is vital for the future nursing workforce. Despite its importance, research on their prosocial behavior, particularly regarding proactive personality and sense of responsibility, is limited, especially compared to the extensive studies on adolescents.

Objective This study aims to investigate the mediating role of sense of responsibility in the relationship between proactive personality and prosocial behavior among undergraduate nursing students.

Methods A cross-sectional study was conducted to recruit 526 nursing and midwifery students. The sense of responsibility, proactive personality, and prosocial behavior scales were applied in this study. We employed Pearson's correlation to assess the relationships between variables and the bootstrap method to test for mediation. All statistical analyses were performed using SPSS22.0.

Results There was a positive correlation between proactive personality and prosocial behavior ($r=0.530$, $p<0.05$), as well as between sense of responsibility and prosocial behavior ($r=0.558$, $p<0.05$). Additionally, a strong positive correlation was observed between sense of responsibility and proactive personality ($r=0.747$, $p<0.05$). The mediating effect of sense of responsibility on the relationship between proactive personality and prosocial behavior was estimated to be 0.33 (95% CI: 0.17, 0.47).

Conclusion The present study elucidated a significant mediating role of sense of responsibility in the relationship between proactive personality and prosocial behavior among undergraduate nursing students. These findings indicate that nursing education may be enhanced by incorporating responsibility training into the curriculum, which could be achieved through the integration of moral education components and the implementation of course-based ideological and political education aimed at fostering students' sense of responsibility and prosocial behavior.

Keywords Prosocial behavior, Sense of responsibility, Proactive personality, Mediating role, Nursing students

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Introduction

Improving the quality of nursing services is a critical goal for nursing educators and healthcare administrators globally, especially in China, where the rapid aging of the population and increasing demand for healthcare services pose significant challenges to the nursing workforce [1, 2]. To address these challenges, it is essential to cultivate a nursing workforce that is not only technically skilled but also equipped with essential prosocial behavior. Prosocial behavior, defined as actions that benefit others and promote social harmony [3, 4], is fundamental to effective patient care and team collaboration. These behaviors, such as cooperation, sharing, helping, humility, comfort, and compassion, play a crucial role in promoting harmonious relationships in healthcare settings [5], especially in China, where collectivism and group harmony are core cultural values. Nursing education plays a vital role in developing these qualities among nursing students, who are the future of the healthcare workforce. This aligns with the National Nursing Development Plan (2021–2025), which emphasizes the importance of fostering high-level nursing leaders capable of meeting the growing healthcare demands [6]. Research indicates that nurses with strong prosocial behavior are better equipped to navigate high-pressure work environments and meet the increasing complexity of healthcare demands [7]. Additionally, it has been found to optimize work environments through improved teamwork and communication, and to enhance patient outcomes by improving safety, reducing medical errors, and increasing patient satisfaction [5, 8]. Moreover, previous studies have shown that prosocial behavior enhances nursing students' psychological resilience and coping abilities, thereby improving their subjective well-being [9]. These findings suggest that prosocial behavior is not only crucial for the personal and professional development of nurses [10] but also plays a significant role in enhancing the overall quality of healthcare delivery and patient care.Therefore, it is essential to explore the factors that influence the development of prosocial behavior among nursing students to inform effective nursing education strategies.

While there is a substantial body of research on prosocial behavior, several key gaps remain that limit our understanding of this phenomenon in the context of nursing education. Most existing studies are conducted in Western cultural contexts that emphasize individualism [5], whereas China's collectivist culture places greater emphasis on group harmony and social responsibility, which may influence the development and expression of prosocial behavior differently.Besides, existing studies have predominantly focused on adolescents, particularly those in middle and high schools [4, 11], with limited attention to undergraduate nursing students. Adolescents are mainly concerned with personal growth and social development within school and community settings [12], whereas nursing students are preparing for professional roles that demand a high degree of responsibility and emotional engagement [13]. Nursing students face unique academic and professional demands, including high-stress clinical environments and the need to demonstrate leadership and compassion in their future roles as healthcare providers [14–16]. However, research on prosocial behavior among nursing students is relatively limited on the international stage. A cross-cultural study comparing the prosocial behavior of nursing students in China and Indonesia revealed that Chinese students scored higher in prosocial behavior within the context of family and friends, whereas Indonesian students exhibited more pronounced prosocial behavior towards strangers [17].These gaps highlight the need for further exploration of these factors to develop culturally relevant and effective nursing education strategies.

To better understand the development of prosocial behavior among nursing students, it is essential to examine the underlying personality traits [18]. Proactive personality is particularly important in nursing education as it reflects an individual's ability to take initiative and adapt to the dynamic and demanding nature of healthcare environments [19]. Nurses with proactive personalities are more likely to seek opportunities for self-improvement, engage in problem-solving, and make positive contributions to their teams [20]. The sense of responsibility is also crucial for ensuring that nursing students are prepared to meet the high standards of care and ethical demands of their future profession [21, 22]. It drives them to fulfill their duties conscientiously and prioritize the well-being of their patients [22]. Studies have shown that both proactive personality and a strong sense of responsibility are positively correlated with prosocial behavior [23, 24]. In the context of Chinese culture, where collectivist values may further reinforce the impact of these traits on prosocial behavior, understanding how proactive personality and sense of responsibility influence prosocial behavior among nursing students is vital for developing effective nursing education strategies.

To elucidate the mediating role of sense of responsibility between proactive personality and prosocial behavior, Self-Determination Theory (SDT) provides a useful framework. According to SDT, proactive personality enhances intrinsic motivation, which in turn promotes the formation of sense of responsibility and subsequently influences prosocial behavior [25, 26]. Specifically, individuals with proactive personalities tend to set future-oriented goals and actively pursue them, thereby enhancing their intrinsic motivation. This intrinsic motivation facilitates the internalization of socially prescribed responsibilities into self-endorsed values,

supported by integrated regulation [27]. The sense of responsibility, as an intrinsic motivator, enables individuals to reframe situational demands as opportunities for self-development and aligns their emotional identity with that of a responsible agent [28, 29]. This process not only explains how proactive personality influences prosocial behavior through sense of responsibility but also underscores the importance of cultivating sense of responsibility in nursing education. Previous research has examined the relationships between prosocial behavior and proactive personality, as well as between sense of responsibility and prosocial behavior, within student populations. For instance, a meta-analysis showed that student's prosocial behavior and proactive personality were the strongest predictors of positive teacher–student relationship quality, yet it did not explore the relationship between prosocial behavior and proactive personality directly [29, 30]. Another study showed that a strong sense of responsibility is a predictor of prosocial behavior [24]. However, there remains a gap in the literature regarding the combined relationships among proactive personality, sense of responsibility, and prosocial behavior, particularly among undergraduate nursing students.

Based on the above background, this study proposes the following research questions and hypotheses:

Research Questions:

1. How is proactive personality related to prosocial behavior among undergraduate nursing students in China?
2. What is the role of sense of responsibility in the relationship between proactive personality and prosocial behavior?

Hypotheses:

H1: Proactive personality is positively associated with prosocial behavior.

H2: Proactive personality is positively associated with sense of responsibility.

H3: Sense of responsibility is positively associated with prosocial behavior.

H4: Sense of responsibility mediates the relationship between proactive personality and prosocial behavior.

This study aims to explore the relationships between proactive personality, sense of responsibility, and prosocial behavior among undergraduate nursing students through a cross-sectional survey, thereby identifying potential intervention targets to promote prosocial behavior in nursing education and informing the development of relevant educational strategies.

Methods

Design & study setting

This cross-sectional study was conducted using convenience sampling at a medical university in Guizhou Province, southwest China. The university, which admits over 700 undergraduate nursing students annually, is a leading institution for nursing education in the region. The methodology was rigorously followed, ensuring adherence to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.

Participants & sampling

This study included full-time undergraduate nursing students enrolled in the academic year 2022–2023, aged 19 years or older, and in their first through third year of study. Fourth-year students were excluded from the study due to the potential confounding effects of their internship experiences, which may expose them to diverse social contexts and professional responsibilities and thereby alter their perceptions and behavior related to prosocial actions. Additionally, participants who did not fully complete the questionnaire were also excluded from the analysis.

Regarding sample size calculation, we adhered to the recommendations from the literature on mediation analysis, which suggest that the required sample size ranges from 40 to 560, with an average of 227 [31]. Our study included 526 valid participants, which is well within the literature's guidelines, ensuring the study has sufficient power to detect mediation effects.

Measurements

The general information questionnaire

To collect demographic and contextual data, the researcher designed a general information questionnaire targeting several key aspects, including gender, the only child, having left-behind experience, student leaders, social practice experience, academic performance and promotion-seeking. The term "The only child" refers to a demographic phenomenon resulting from China's family planning policy, which restricted most families to having a single child. "Left-behind experience" describes situations where children or adolescents are left in their hometown or entrusted to other relatives for a period exceeding six months due to parental migration or other factors. "Student leaders" refer to those who hold positions in their classes or school clubs such as class president, president of the student council, etc. "Social practice experience" refers to students' internship and part-time activities after school or off-campus, including experience in volunteer medicine, part-time work, etc. Academic performance was categorized into three tiers: the top 25% of students were classified as "upstream," the middle 50% as "midstream," and the bottom 25% as

"downstream." Finally, the questionnaire examined students' intentions to pursue a master's degree in nursing following undergraduate studies, a goal referred to as "promotion-seeking."

The sense of responsibility scale

The Sense of Responsibility Scale, developed by Li and Guo [32], was employed to assess individuals' sense of responsibility. This scale comprises 19 items, organized into four dimensions: courage, altruism, self-control, and responsibility. It utilizes a 7-point Likert scale, with response options ranging from 1 ("not at all") to 7 ("very much"). Total scores on the scale can range from 19 to 133, with higher scores indicating a greater sense of responsibility. In this study, the Cronbach's alpha coefficient was 0.938, indicating high internal consistency.

The proactive personality scale

The Proactive Personality Scale (PPS), originally developed by Bateman and Crant [33], was employed in this study using the Chinese version revised by Shang and Gan [34]. This instrument consists of 11 items measured on a unidimensional seven-point Likert scale, where responses range from 1 ("strongly disagree") to 7 ("strongly agree"). The total score ranges from 11 to 77, with higher scores indicating greater proactive personality traits. The scale has demonstrated excellent reliability among Chinese student populations, with a Cronbach's α of 0.911, signifying high internal consistency.

Prosocial behavior scale

The prosocial Behavior Scale was originally developed by Carlo & Randall [3] and later adapted for Chinese contexts by Cong et al. [35]. The scale consists of 23 items distributed across six dimensions: overt, anonymous, altruistic, compliant, emotional, and urgent prosocial behavior. This is a five-point Likert scale, with total scores ranging from 23 to 115, where higher scores indicate greater levels of prosocial behavior. In the present study, the scale demonstrated excellent internal consistency, with a Cronbach's α of 0.936.

Data collection methods

The data collection for our study was facilitated through a systematic approach leveraging the online platform Questionnaire Star. As a nursing faculty member at the medical university, the principal investigator (PI) collaborated with the class advisors of nursing and midwifery programs across first-, second-, and third-year cohorts. These advisors were instrumental in disseminating the study's call for participants, which included a QR code and a link to the survey, along with an advertisement for the research.

The recruitment strategy was designed to maximize voluntary participation. Students were invited to take part in the online survey, which was accessible by scanning the provided QR code. Prior to commencing the survey, participants were presented with a comprehensive explanation outlining the purpose, significance, and scope of the study. This was followed by an informed consent form, which participants had to agree to before proceeding.

The online questionnaire required completion of all mandatory questions, and a logic check was embedded to ensure the veracity and consistency of the responses. To maintain data integrity and prevent multiple submissions, each participant was identified by a unique ID, allowing only one submission per individual. We received 546 completed questionnaires online but eliminated 20 invalid ones (due to shorter response times, consistent answers, or logical inconsistencies). Ultimately, we obtained 526 valid questionnaires with a high validity rate of 96.34%.

Ethical considerations

The Ethics Review Committee of the Medical University granted permission to conduct the study. Participation in the survey was entirely voluntary, and data were collected anonymously. All participants provided informed consent, willingly and voluntarily, before participating in the study. The study was conducted in accordance with the Declaration of Helsinki.

Statistical analysis

In this study, data collection and analysis were conducted using SPSS 24.0 software. To ensure that the assumptions required for subsequent statistical analyses were met, normality tests were performed on all continuous variables. The P_P plots indicate the data showed an approximately normal distribution. Continuous variables were described using means and standard deviations. The prosocial behavior scores of nursing students were compared based on various characteristics using independent samples t-test and one-way ANOVA. Correlation analysis was performed using Pearson's method to examine the relationship between nursing students' sense of responsibility, proactive personality, and prosocial behavior.

Mediation analysis is a statistical method used to investigate how an independent variable (X) influences a dependent variable (Y) through one or more mediator variables (M). This approach is instrumental in revealing the underlying mechanisms between variables and aids researchers in understanding how the independent variable affects the dependent variable via the mediator [36]. In this study, Model 4 was implemented using the process plugin of the SPSS macro program developed by Hayes [37] to test the mediation effect between proactive

Table 1 General information and one-way analysis of prosocial behavior of undergraduate nursing students ($N = 526$)

Projects	Frequency (%)	M ± SD	Statistics (t/F)	*P*-value
Gender			0.54[a)]	0.591
Male	121 (23.0%)	72.6 ± 11.4		
Female	405 (77.0%)	72.0 ± 11.0		
The Only Child			-1.21[a)]	0.226
Yes	50 (9.5%)	70.4 ± 10.3		
No	476 (90.5%)	72.4 ± 11.1		
Place of origin			0.43[b)]	0.654
Rural	416 (79.1%)	72.2 ± 11.2		
City	32 (6.1%)	73.5 ± 10.6		
Cities and towns	78 (14.8%)	71.4 ± 10.7		
Left behind experience			-0.53[a)]	0.596
Yes	290 (55.1%)	71.9 ± 10.8		
No	236 (44.9%)	72.4 ± 11.4		
Student leaders			1.14[a)]	0.256
Yes	112 (21.3%)	73.2 ± 12.3		
No	414 (78.7%)	71.9 ± 10.7		
Social practice experience			2.30[a)]	0.022
Yes	304 (57.8%)	73.1 ± 11.7		
No	222 (42.2%)	70.9 ± 10.0		
Promotion-seeking				
Yes	441 (83.8%)	72.7 ± 11.2	2.64[a)]	0.009
No	85 (16.2%)	69.3 ± 9.7		
Personality			4.16[b)]	0.018
introverted	108 (20.5%)	69.8 ± 9.6		
Extrovert	70 (13.3%)	74.3 ± 13.4		
Neutral	348 (66.2%)	72.5 ± 10.60		
Academic performance			3.11[b)]	0.047
Upstream	70 (13.3%)	72.8 ± 10.0		
Midstream	347 (66.0%)	72.8 ± 11.1		
Downstream	109 (20.7%)	69.8 ± 11.4		

Note. a) two independent samples t-test; b) ANOVA

LSD post-hoc comparisons showed a significant difference between extroverted personality of undergraduate nursing students and introverted and neutral in prosocial behavior scores, with extrovert > introverted > neutral

M: Means; SD: Standard Deviation

personality, sense of responsibility, and prosocial behavior. The PROCESS macro was chosen due to its robustness and flexibility in conducting mediation analysis within the framework of ordinary least squares regression. It allows for the simultaneous estimation of direct and indirect effects, providing a comprehensive understanding of the relationships between variables. The sense of responsibility was specified as the mediator, and prosocial behavior as the dependent variable. The mediation effect was tested using the bootstrap method with 5000 resamples, and statistical significance was determined at $p < 0.05$.

Table 2 Correlations between prosocial behavior and sense of responsibility and proactive personality

Variables	M ± SD	prosocial behavior	Sense of responsibility	Proactive personality
prosocial behavior	72.16 ± 11.06	1		
Sense of responsibility	95.28 ± 14.86	0.558**	1	
Proactive personality	55.10 ± 8.88	0.530**	0.747**	1

Note. **. Correlation significant at 0.01 level (two-tailed).

M: Means; SD: Standard Deviation.

Results

General information and univariate analysis of undergraduate nursing students

Questionnaires from undergraduate nursing students were included in the data analysis. Among the respondents, 405 (77.0%) were female and 290 (55.1%) reported having left-behind experiences (as shown in Table 1). Univariate analysis showed statistically significant differences in prosocial scores based on social practice experience, promotion-seeking, personality, and academic performance.

Correlations between sense of responsibility, proactive personality, and prosocial behavior

Undergraduate nursing students reported mean scores of 95.28 ± 14.86 for sense of responsibility, 55.10 ± 8.88 for proactive personality, and 72.16 ± 11.06 for prosocial behavior. Significant positive correlations were observed among these variables: between sense of responsibility and proactive personality ($r = 0.747$, $p < 0.05$), between sense of responsibility and prosocial behavior ($r = 0.558$, $p < 0.05$), and between proactive personality and prosocial behavior ($r = 0.530$, $p < 0.05$). These results are summarized in Table 2.

Mediating effects of undergraduate nursing students' sense of responsibility between proactive personality and prosocial behavior

After controlling for confounding variables (Four variables that showed statistically significant differences in univariate analysis: social practice experience, promotion-seeking, personality, and academic performance), our analysis still found a significant positive association between proactive personality and prosocial behavior ($\beta = 0.65$, $p < 0.001$). This association suggests that for each one-unit increase in the proactive personality score, the prosocial behavior score is expected to increase by 0.65 units. The observed effect size is classified as medium to large, indicating a substantial relationship between proactive personality and prosocial behavior.

Table 3 Intermediary regression path analysis

Variables	Dependent variable: prosocial behavior			Dependent variable: Sense of responsibility			Dependent variable: prosocial behavior		
	B	SE	t	B	SE	t	B	SE	t
Constants	38.55	3.96	9.74	34.42	4.10	8.38	29.21	4.05	7.21
Proactive personality	0.65	0.05	13.63***	1.19	0.05	24.34***	0.32	0.07	4.83***
Sense of responsibility							0.27	0.04	6.68***
R^2	0.29			0.57			0.34		
F (df)	41.90***			140.78***			45.27***		

Note: B is the unstandardized regression coefficient; SE is the standard error; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. The following variables were included as confounders: social practice experience, promotion-seeking, personality, and academic performance.

Table 4 Decomposition of total, direct and mediated effects

Type of effect	Efficiency value	SE	Bootstrap 95%		Relative effects
			Lower	Upper	
Total effect	0.65	0.06	0.53	0.76	
Direct effects	0.32	0.07	0.14	0.40	49.23%
Indirect effects	0.33	0.08	0.17	0.47	50.77%

Note. SE is the standard error. The following variables were included as confounders: social practice experience, promotion-seeking, personality, and academic performance.

Even after accounting for mediating variables, the association between proactive personality and prosocial behavior remained significant ($\beta = 0.32$, $p < 0.001$).

Additionally, the analysis found a significant positive association between proactive personality and the sense of responsibility ($\beta = 1.19$, $p < 0.001$), and the sense of responsibility, in turn, demonstrated a significant positive association with prosocial behavior ($\beta = 0.27$, $p < 0.001$), as shown in Table 3.

The direct effect value of proactive personality on prosocial behavior was 0.32, with a 95% confidence interval (CI) that excluded 0, accounting for 49.23% of the total effect. The medidating effect value of the sense of responsibility in the ralationship between proactive personality and prosocial behavior was 0.33, with a 95% CI that excluded 0, demonstrating the partial mediating role of the sense of responsibility, contirbuting to 50.77% of the total effect (Table 4 and Fig. 1).

Notably, the significant associations were found both before and after controlling for confounding variables (see Supplementary Tables 1 and 2 for the unadjusted results), demonstrating the robustness of our findings.

Discussion

This cross-sectional study found that undergraduate nursing students' prosocial behavior is relatively low. Moreover, sense of responsibility mediated the association between proactive personality and prosocial behavior. These findings suggest that nursing educators and administrators could improve students' prosocial behavior by fostering a greater sense of responsibility during their training.

The prosocial behavior of undergraduate nursing students needs to be promoted

The present study revealed that the prosocial behavior of undergraduate nursing students is generally at a moderate level, consistent with previous studies conducted in China [38], Turkey [39]. This indicates that nursing students have already established a certain foundation in

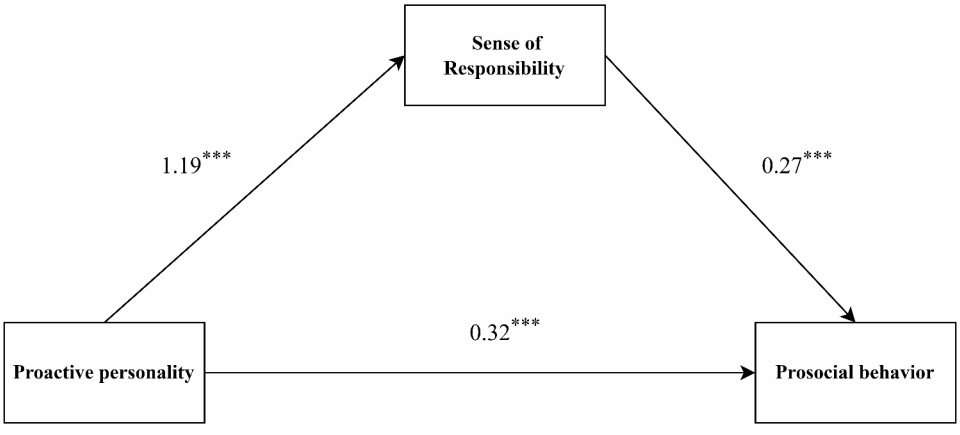

Fig. 1 Mediation Model of Proactive Personality and Prosocial BehaviorPath diagram showing the relationship between proactive personality and prosocial behavior, mediated by sense of responsibility. The model was adjusted for confounding variables (social practice experience, promotion-seeking, personality, and academic performance)

prosocial behavior, yet there remains considerable room for improvement. Previous research has also demonstrated that prosocial behavior holds immense value in nursing practice. It not only reflects the essence of the nursing profession—centred on humanistic care—but also serves as a key factor in enhancing the quality of nursing services, increasing patient satisfaction, and fostering harmonious nurse-patient relationships [40]. For instance, studies have shown that nursing staff with higher levels of prosocial behavior are better able to meet the psychological and emotional needs of patients [41], thereby significantly improving the overall quality of nursing care.

Moreover, nursing is a profession characterised by high risk, high demands, and high intensity. Nursing personnel are required to maintain a high sense of responsibility and empathy in complex and dynamic working environments. The cultivation of prosocial behavior can help nursing students better adapt to future professional challenges and enhance their professional identity and social responsibility [40–42]. Therefore, nursing educators should prioritise this issue and take comprehensive measures to improve the prosocial behavior of nursing students. These measures may include optimising the curriculum, strengthening humanistic education, and engaging students in social practice activities. For example, increasing the number of humanistic nursing courses, organising community service activities, and providing psychological counselling during clinical practice may help students better understand and implement prosocial behavior.

The relationship between proactive personality, sense of responsibility, and prosocial behavior of undergraduate nursing students

This study found that undergraduate nursing students with higher proactive personality had greater prosocial behavior, supporting hypothesis 1. This finding underscores the importance of proactive personality in predicting prosocial behavior, highlighting the potential for interventions aimed at enhancing proactive personality to foster more collaborative and supportive social environments. As Eisenberg's theoretical model outlines, prosocial behavior is a three-stage process, which is noticing the needs of others, determining the intention to help, and linking intent with behavior. Personality traits influence individuals' ability to notice, intend, and act on the needs of others [18, 43, 44]. Nursing students with proactive personalities may exhibit heightened environmental awareness and responsiveness, making them more likely to engage in prosocial actions [45]. This finding supports the potential value of incorporating personality-development training into nursing curricula to promote a culture of care and responsiveness.

We also found that nursing students with a higher proactive personality tend to have a stronger sense of responsibility, which supports our hypothesis 2. Proactive individuals often possess higher levels of intrinsic motivation and self-efficacy, which underpin their ability to take ownership of their actions [46, 47]. Besides, we also found that nursing students with a strong sense of responsibility tend to exhibit a greater degree of prosocial behavior, which aligns with our hypothesis 3. The sense of responsibility serve as a positive psychological resource to provide an internal emotional drive [46, 47]. According to the theory of ego depletion, engaging in prosocial behavior may deplete an individual's inner self [48]. However, sense of responsibility can help replenish an individual's internal psychological resources during emergencies, allowing for the recovery of temporarily depleted resources from previously performed volitional activities. As a result, nursing students with a higher sense of responsibility are more likely to recover from the depletion of their mental resources through mobilizing positive psychological resources, resulting in the continued production of prosocial behavior. Therefore, nursing education should incorporate targeted strategies to cultivate students' sense of responsibility and proactive personality traits, enabling a deeper understanding of the nursing profession and fostering intrinsic motivation to sustain prosocial behavior, which are essential to nursing practice.

Sense of responsibility partially mediating the influence of proactive personality on prosocial behavior in nursing students

The study further identified that the relationship between proactive personality and prosocial behavior is partially mediated by sense of responsibility, supporting our hypothesis 4. To our knowledge, this is the first study to explore the relationship among these three constructs. Initially, a proactive personality is characterized by a stable inclination for individuals to take initiative in shaping their environment, which can serve as an intrinsic motivational basis for cultivating a sense of responsibility. According to Self-Determination Theory, individuals with a proactive personality are more likely to satisfy the three fundamental psychological needs: autonomy, competence, and relatedness [25]. This fulfillment subsequently fosters intrinsic motivation for prosocial behavior, specifically manifesting as a sense of responsibility. In particular, nursing undergraduates with a proactive personality are more inclined to actively select and shape conditions that facilitate their personal development. This includes proactively adapting to professional learning demands, actively engaging in nursing practice and educational activities, and enhancing their career adaptability and professional identity [49–52]. Such processes

further internalize the professional ethos of nursing, such as "dedication" and "sacrifice," into personal commitments and values, thereby nurturing a sense of responsibility. Furthermore, individuals exhibiting a proactive personality are often associated with elevated levels of self-efficacy, leadership capabilities, and interpersonal skills [25]. Nursing undergraduates who possess high self-efficacy generally demonstrate greater competence and a propensity to undertake responsibilities in a proactive manner [53]. Furthermore, individuals with robust leadership and interpersonal skills are more adept at fostering social connections [54], which increases the likelihood of integrating group interests into their value systems and cultivating a sense of responsibility towards others. This phenomenon is consistent with the collectivist cultural values prevalent in Chinese society, which emphasize the prioritization of group interests over individual concerns [55, 56].

Sense of responsibility, by fostering an intrinsic obligation among individuals, encourages them to critically evaluate the effects of their actions on the well-being of others. When individuals incorporate "meeting the needs of others" into their self-concept, they develop an intrinsic sense of moral responsibility that transcends self-interest and promotes prosocial behavior [57]. Notably, the mediating effect observed in this study is particularly accentuated within the framework of collectivist cultures. In this context, the traditional Chinese value of "benevolence" intertwines with ethical responsibility, leading nursing students to elevate their professional duties to a moral imperative [58]. The medical oath, "health entrusted, lives in our hands," is internalized through a process of responsibility assimilation, thereby transforming institutional mandates into emotionally significant moral practices. This suggest that in nursing education, it is crucial to prioritize the cultivation of students' proactive personality traits and sense of responsibility in order to foster the development of prosocial behavior. Concurrently, harnessing the benefits of collectivist cultural values to reinforce the internalization of responsibility might be an effect approach to enhance the effectiveness of nursing education.

Implications for nursing education

The findings of this study offer significant practical insights for nursing education, particularly in understanding how proactive personality and sense of responsibility can be leveraged to promote prosocial behavior among undergraduate nursing students. Given the partial mediating role of sense of responsibility in the relationship between proactive personality and prosocial behavior, nursing education should focus on cultivating these key traits to enhance students' professional development and ethical commitment.

Firstly, nursing education should incorporate diverse teaching activities that emphasize the development of proactive personality and a strong sense of responsibility. For example, service-learning projects and community-based practices can provide students with real-world contexts to experience the importance of responsibility and transform it into concrete prosocial actions, such as actively caring for patients or engaging in public health services. These activities align with the core values of the nursing profession and can effectively enhance students' intrinsic motivation to contribute positively to the community.

Secondly, nursing educators can leverage positive elements from collectivist culture, such as the traditional value of "benevolence in medicine," to help students internalize professional responsibility. Through case-based teaching and situational simulations, these cultural values can be effectively integrated into the educational process. This approach not only enhances students' sense of responsibility but also fosters the development of prosocial behavior.

Additionally, the implementation of "Curriculum Ideological and Political Education" (CIPE) is highly recommended [59]. This distinctive educational approach in China integrates moral and political education into professional courses, enhancing students' sense of responsibility and promoting the development of prosocial behavior. By embedding ethical and social responsibility into the nursing curriculum, CIPE can effectively improve students' intrinsic motivation and professional identity.

Limitations and recommendations

This study has several limitations that merit discussion. First, the sample was restricted to undergraduate nursing students from a single medical institution in southwest China, which limits the generalization of the findings. Although the sample size of 526 participants provides a degree of statistical reliability, its regional specificity does not fully capture the diverse perspectives of nursing students across China. Future research should employ multistage sampling techniques to ensure a more representative and diverse sample, encompassing various regions and institutions.

Second, the cross-sectional design of this study limits our ability to establish causal relationships and track the development of prosocial behavior and personality traits over time. Longitudinal studies are recommended to explore the developmental trajectories of proactive personality, sense of responsibility, and prosocial behavior across academic stages, providing insights into how these traits evolve as students progress.

Third, while the study primarily examined proactive personality and sense of responsibility as contributors

to prosocial behavior, it did not account for other potentially influential factors, such as self-esteem, cultural background, prior volunteer experience, individual personality traits, academic pressures, empathy [60], perceived self-competence, career motivation, environmental factors, and family influences. The exclusion of these variables and their potential moderating effects narrows the scope of the findings. Incorporating these factors in future research would enhance external validity and provide a more comprehensive understanding of these relationships.

Moreover, the reliance on self-reported data introduces the possibility of reporting bias. Future studies should include objective methods, such as behavioral observations and peer evaluations, to achieve a more accurate assessment of prosocial behavior. Finally, the absence of qualitative data limits the depth of understanding regarding the motivations and challenges underlying prosocial behavior. While the quantitative approach effectively identifies correlations, it falls short of capturing experiential insights. A mixed-methods approach is recommended for future studies to combine the strengths of both qualitative and quantitative methodologies, offering a more holistic perspective on the factors shaping prosocial behavior among nursing students.

Conclusion

prosocial behavior among undergraduate nursing students is a critical area of concern and importance. This study has identified a positive correlation between proactive personality traits and prosocial behavior, with sense of responsibility emerging as a significant mediating factor in this relationship. These findings suggest that cultivating sense of responsibility could be an effective strategy for enhancing prosocial tendencies among nursing students. Considering the cultural emphasis on collectivism and responsibility within Chinese society, integrating curriculum ideology and political elements into nursing undergraduate education may be a valuable approach to reinforce students' social responsibility. Such integration has the potential not only to enhance students' prosocial behavior but also to contribute to their professional and personal development. This approach, which underscores cultural competence and social responsibility, may provide valuable insights for nursing educators in other cultural contexts, highlighting the potential applicability of similar educational strategies to foster prosocial behavior among nursing students.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12909-025-07068-z.

Supplementary Material 1

Supplementary Material 2

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Data availability
Availability of data and materials：The data used to support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Conflict of interest
The authors declared no conflict of interest.

Ethics declarations
The Ethics Review Committee of Guizhou Medical University granted permission to conduct the study (Reference No. 2022 – 273). Participation in the survey was entirely voluntary, and data was collected anonymously. All participants provided informed consent, willingly and voluntarily, before participating in the study.The study was conducted in accordance with the Declaration of Helsinki.

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