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Investigating the status and influencing factors of professional identity formation among Chinese medical interns: a mixed methods study

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Abstract

Background Professional Identity Formation (PIF) involves a movement through a series of conceptually distinct developmental stages. Kegan's theory of PIF is divided into 6 phases (stages 0–5). It is believed that students undergo stages 2–4 (imperial, interpersonal, institutional) during medical education. Currently, the PIF of medical interns is being extensively studied. However, few studies on Chinese interns. Social-ecological theory (STC) suggests that an individual's behavior and development are shaped by his or her multilevel interactions with the environment, so it's necessary to explore the mechanisms of interns' PIF within Chinese socio-cultural settings.

Aim This study assesses the PIF status of Chinese medical interns and investigates interactions between multidimensional influencing factors underlining the process of PIF.

Methods This is a convergent mixed methods case study and consists of two parallel parts. The quantitative research involved a cross-sectional survey using online questionnaires on PIF, job burnout, and resilience. Four stage-specific scales (SASs) and a development scale (DS) were used to quantify the complexity and divergent processes of PIF. In the qualitative research, authors arranged semi-structured face-to-face interviews with medical interns. Data collection and analysis were conducted simultaneously. The model of Reciprocal Determinism is used as theoretical framework until data saturation was achieved.

Results A total of 1054 responses were considered valid. Interns' score of stage 4-specific attribute scale (SAS-4) scoring significantly higher than other SASs. Gender, higher family income, receiving scholarships, having continuous mentor guidance, and having clear career plans were identified factors that influences different stages of intern's PIF. Seven themes that influence PIF were identified from the qualitative research. The interplays between personal,

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behavioral, and environmental factors are bidirectional and complex. The Balancing of these complex relationships is identified as a crucial factor in PIF.

Conclusion This study illustrates that Chinese medical interns were at stage 4 according to Kegan's model. Additionally, the reciprocal interactions between personal, behavioral, and environmental aspects can serve as potential mechanisms for PIF.

Keywords Professional identity formation, Medical interns, Kegan's model, Social cognitive theory, Mixed methods case study

Introduction

Professional Identity (PI) refers to an individual's internal construction of beliefs, attitudes, and values towards their chosen profession, which encompasses the individual's identification with their professional role and responsibilities within a professional group [1]. A physician's identity is a representation of self, achieved over time during which the characteristics, values, and norms of the medical profession are internalized, resulting in an individual thinking, acting, and feeling like a physician [2]. Professional Identity Formation (PIF) involves a movement through a series of conceptually distinct developmental stages. These stages are characterized by qualitatively different ways of understanding (and being able to understand) both one's environment and one's place in that environment [3]. In the context of medical education, medical students and junior residents are not just immature versions of expert physicians [4]. Instead, they possess a distinct cognitive perspective compared to expert physicians, both in their perception of the world and their understanding of their own role within it. The internship stage serves as a significant transitional phase for medical students as they shift from being students to formal staff, which is a crucial period for the development of their PI [5]. Currently, there is significant research being conducted on the PIF of medical interns. Nevertheless, there remains a dearth of research conducted within the Chinese socio-cultural setting, particularly in terms of longitudinal studies throughout different stages. Furthermore, there is a scarcity of study examining the multidimensional influencing elements and their underlying mechanisms within this socio-cultural context.

As the development of PI occurs in stages within the context of PIF, Kegan's human developmental model which indicates a framework for the longitudinal psychological development of the self into a moral and meaning-making entity aligns well with the central idea of PIF. And there have been several studies applying Kegan's theory to PIF in healthcare workers [2, 3, 6, 7]. Kegan's theory of PIF is divided into 6 phases: the incorporation, impulsion, imperial, interpersonal, institutional, and inter-individual stages. It is believed that students undergo stages 2–4 during medical education. Based on Kegan's theory, Tagawa et al. developed PIF scales, which includes 4

Stage-specific attribute scales (SASs) [6, 8]. These scales have been applied and verified in different cultures [9]. According to Kegan's theory, the stage of PIF in medical interns can be clearly understood. However, it does not reveal from a multidimensional perspective the fundamental causes and mechanisms behind the current stage. Only by delving deeper into the factors influencing this phenomenon can we better propose interventions to optimize the PIF of medical students, as PIF is a dynamic process influenced by various factors.

A scoping review on PIF among medical students highlights that it is a multifactorial phenomenon which involves a continuous construction and deconstruction of individual, relational and societal identities [10]. This dynamic nature can be influenced by individual values and beliefs and their interactions with environmental factors including clinical and non-clinical experiences of medical students. As for personal factors, resilience is the key positive moderator, while burnout is a common negative influence [11, 12]. And studies have underscored the strong influence of the culture towards clinical year students' responses when they encounter professional dilemma, showing that professionalism and PIF are always contextual and should consider sociocultural backgrounds [13, 14]. Some studies have revealed that internal and external factors can jointly affect PIF [9]. However, those studies neglected that the interactions between internal and external factors also dynamically affect the process and outcome of PIF. Therefore, we try to choose a theory with a broader perspective as a framework to explore the three-dimensional relationship of multidimensional factors from multiple perspectives, elucidating the potential mechanisms by which they affect PIF. Social Cognitive Theory (SCT) (Bandura, 1986) is one of the behavioral change theories widely applied in public health programs, health interventions, and medical education [15]. The integration of psychological and sociological framings of SCT aligns well with the dual nature (psychological development of the person and socialization of the person into appropriate roles in community works) of PIF, and the dynamics of SCT reciprocal determinism matches the dynamics of PIF as described earlier. Sawatsky et al. have used the concept of reciprocal determinism to highlight the interconnectedness of autonomy, identity, and making decisions in PIF [16]. While the study emphasized the significance of maintaining a balance between autonomy and supervision for PIF, it didn't encompass all other features within the model. In addition, there is a limited number of studies investigating the factors that influence PIF in Chinese context, and it is still necessary to verify the applicability of findings from other cultures.

While Kegan's theory highlights the natural, timeintensive evolution of identity, the medical context demands active cultivation of PIF to meet immediate professional responsibilities. Accelerating PIF through structured support does not shortcut development but optimizes it for high-stakes environments, ensuring interns embody the values and competencies required for safe, compassionate care [6-8]. Failure to prioritize this risks both individual trainee well-being and systemic healthcare quality. The objective of our study is to investigate the dynamic mechanisms of the influencing factors of PIF in the Chinese context and to offer a broader global perspective on PIF. Moreover, studies aiming to measure PIF using a quantitative tool and to explore it using qualitative approaches are usually conducted separately. The extensive variety makes it challenging to establish a unified conclusion and theoretical framework [17–20]. Therefore, this study takes a comprehensive perspective from sociology and psychology, adopting mixed methods to combine the advantages of qualitative and quantitative research. It aims to obtain specific experiences, emotional experiences, and cognitive processes of medical students during internship to achieve the following research objectives: ^①To revealing the level of PIF that has reached for Chinese medical interns during the early phases of internship based on Kegan's theory. To explore the multidimensional influencing factors of PIF among medical interns in the Chinese cultural context and the potential interactions between PIF influencing factors (behavioral factors, personal factors and environmental factors) based on SCT.3To suggest potential measures that may enhance the PI of medical interns.

Methods

Study design

The study was conducted in the First Affiliated Hospital of Zhengzhou University (known as the largest tertiary hospital all over the world with more than 10,000 beds), which is located in Henan province in central China. The hospital comprises four campuses, each located in different directions of Zhengzhou City, approximately 30 km apart. Homogenized management is implemented across these campuses, with similar internship management approaches. We employ the longitudinal design in our study, setting a relatively complete learning cycle (10 months) as the research period. We select medical interns as the subjects for this study. This approach also allows for the longitudinal observation of the potential patterns in the evolution and development of PIF over time. This study represents the first phase of this larger research project (August 2023) and adopts a convergent mixed methods design, aiming to explore the status and influential factors on the PIF of medical students in the early stages of their internship. The specific research design is illustrated in Fig. 1. Participants in the survey provided written informed consent at the beginning of the study, and participants in the qualitative component of the study were consented separately prior to the interviews. The entire mixed methods study was reported according to the Good Reporting of a Mixed Methods Study and the qualitative part was reported according to the Consolidated Criteria for Reporting Qualitative Research (COREQ) reporting guideline, which are shown in appendix 1 and 2.

Participants

Quantitative study participants

A full-sample sampling method is applied in the quantitative research phase. The participants in the quantitative study are interns who major in medical-related subjects at the sample hospital. These interns are either undergraduate (4-year program) or junior college students (3-year program); among the undergraduates, there are first-tier and second-tier colleges, with the former generally being key universities in China, having overall stronger capabilities than the second-tier. In the final year of their study, medical students are required to complete about one year of internship in medical institutions, typically starting in July and ending around April of the following year. Interns participating in this study come from 10 different majors including clinical medicine, rehabilitation, medical laboratory science, medical imaging technology, and pharmacy, etc.

Qualitative study participants

We employed purposive sampling to appeal participants for qualitative study. In the preliminary online survey, we sent invitations to 1054 medical interns who participated in the quantitative survey to invite them to take part in semi-structured focus group discussions. Following the principle of convenience for participants, interviews were generally arranged at the campus where the participants were situated, and all interviews were conducted in undisturbed office spaces. We monitored the recruitment of invited resident physicians to ensure that we sampled medical interns evenly from different majors with different educational level to obtain a broad perspective on PIF. We organized 25 medical interns into 7 focus group interviews and 3 individual interviews according to their considerations and schedules.



Fig. 1 Study design and implementation steps

Data collection

Quantitative study data collection

The quantitative research utilized scales including the PIF scales, Chinese version of the Connor-Davidson Resilience Scale (CD-RISC-25), and Maslach Burnout Inventory (MBI). The survey for the development of PI utilizes the PIF scales developed by Masami Tagawa, comprising 4 stage-specific scales (SASs) and a development scale (DS) to quantify the complexity and divergent processes of PIF [6, 8]. The use of the questionnaire was supported by the construct validity and good reliability of the questionnaire which is aligned with the PIF stages of medical students based on Kegan's model. The stage 2-specific attribute scale (SAS-2), stage 3-specific attribute scale (SAS-3), and stage 4-specific attribute scale (SAS-4) align with the stage 2 to 4 stages of Kegan's model, and stage 4 or higher- specific attribute scale (SAS-h) was developed to assess attributes expected at stage 4 or higher, whose items describing an individual who clearly recognized professional roles, and his reason was in full control over needs, desires, and passion, and did not perceive him/ herself as having a single identity and was open to other influences. Each item was scored on a 7-point Likert scale that ranged from 1 (completely inapplicable) to 7 (greatly applicable), and 4 was neutral. The mean score of lower stage-specific attributes decreases and that of higher stage-specific attributes increase as the level of education and clinical experience advance. The scale was translated from English into Chinese and then back translated to assure meaning comparability and content validity. The CD-RISC-25 was used to evaluate individual resilience, designed by Connor KM and Davidson JR [21] and translated by Yu et al. [22]. This valid and reliable scale comprises 25 items rated on a five-point Likert scale from 0 (not true at all) to 4 (true all the time). The total score of the scale ranges from 0 to 100, with a higher score indicating higher resilience [22]. The MBI was developed in 1981 by American psychologists Maslach and Jackson [23], and has been widely used internationally due to its good reliability and validity [24]. The version used in this study is the Chinese translation by Professor Peng Meici from the Hong Kong Polytechnic University. All items are rated on a 7-point scale, using a 0-6 scoring system. A preliminary investigation was conducted before the formal survey to test the feasibility of the survey.

The online survey was conducted using the Questionnaire Star platform (Changsha Ranxing Information Technology Co., Ltd), a widely used online questionnaire platform in China. The online questionnaire (see Appendix 3) for this study comprised ten main parts: an invitation letter to participate in the study, a written consent form, sociodemographic information, the Chinese version of the CD-RISC-25, the MBI, the SAS-2, the SAS-3, the SAS-4, the SAS-h, and the DS. With the assistance of the teaching secretaries and staff of the education department of the sample hospital, researchers distributed the online questionnaire to participants via a QR code or link on Questionnaire Star. Participants voluntarily filled out the questionnaire after reading the informed consent form. The questionnaire was available for completion from August 1, 2023, to August 30, 2023.

Qualitative study data collection

At the qualitative research stage, we developed an interview topic guide based on the SCT theory, which was preliminarily reviewed by a panel of experts and pretested through pilot interviews. The guide included questions about the differences between medical interns' expectations and their actual internship experiences, the impact of the internship process on the interns' professional emotions, and factors influencing professional emotions (see Appendix 4). All interviews were conducted by a team member with interviewing experience (ZY), while another research member (JYD) was responsible for recording the process. All of the participants were speaking mandarin as the interviewers, ensuring linguistic consistency throughout the data collection process. The interviewer followed up on the discussion based on the participants' responses. Data analysis was conducted concurrently with data collection, allowing the interview guide to evolve over time and provide specific focus for future interviews. The research team members were anonymized before coding and analyzing the interview records. The interview texts were uploaded to NVivo 10 for data analysis.

Data analysis

Quantitative study data analysis

The online survey responses were exported from Questionnaire Star into an Excel file (Excel version 2016; Microsoft Corp., Redmond, WA, USA). The data was then cleaned and analyzed using IBM SPSS° statistics software version 26 (Armonk, NY, USA). For demographic data, measurement data were expressed as Mean ± Standard Deviation, and count data were expressed as percentages. Total scores for the PIF, CD-RISC-25, and the MBI were calculated for each participant by summing their respective individual item scores. The Shapiro-Wilk test was used to assess the normality of data (p < 0.05, indicating that PIF scores did not follow a normal distribution). For two-group comparisons of PIF scores, the Mann-Whitney U test was used; for three-group comparisons, the Kruskal-Wallis non-parametric test was applied. Spearman's correlation was conducted to assess correlations between burnout, resilience, and PIF. All statistical tests were two-tailed, and p-values < 0.05 were considered statistically significant.

Qualitative study data analysis

Thematic analysis was used for data analysis, with the following steps: (1) Familiarizing with the data. This involved reading all interview data to establish a preliminary understanding, combined with the results of the literature review conducted by our research group, leading to the decision to use SCT as the theoretical framework for data analysis. (2) Initial coding. Two researchers (ZY and JYD) independently completed the initial coding process using an inductive approach. (3) Defining themes. Through the iterative process of data collection and analysis, existing codes were organized and categorized under different potential themes. (4) Reviewing themes. Multiple group discussions were held, primarily led by two researchers (ZY and JYD), to review and continually adjust the structure of the themes until a consensus was reached within the group. This allowed us to guide the data collection process in line with the SCT theoretical framework while collecting data. (5) Through this process, we achieved sufficient consensus on the interactive effects of PIF among medical interns. Finally, representative quotations were selected through group discussion.

Integration of qualitative and quantitative findings

The framework of Reciprocal Determinism [25] was used to conduct the integration of qualitative and quantitative findings. We employed the joint display method to integrate, compare, and meta-infer the quantitative survey data with the themes from qualitative research, thereby defining the three main themes of Person, Environment, and Behavior in this study. In the context of Reciprocal Determinism, 'Person' refers to an individual's thoughts, emotional status, beliefs, and other cognitive factors; 'Behavior' refers to observable actions or responses, such as the formation of cognition corresponding changes in activities. 'Environment' includes external influences, social context, or situational factors. We then used the bidirectional influence of 'Reciprocal Determinism' to

	Number of items	Mean (SD)				
DS	15	64.15 (7.59)				
SAS						
SAS-2	11	3.85 (0.54)				
SAS-3	6	3.78 (0.56)				
SAS-4	3	5.28 (1.02)				
SAS-h	6	4.92 (0.74)				
CD-RISC-25	25	59.63 (14.69)				
MBI	22	56,23 (14,36)				

SD: Standard Deviation; DS: development scale; SAS: stage specific attribute scale; SAS-2: stage 2-specific attribute scale; SAS-3: stage 3-specific attribute scale; SAS-4: stage 4-specific attribute scale; SAS-h: stage 4 and higher-specific attribute scale; CD-RISC-25: Connor-Davidson Resilience Scale; MBI: Maslach Burnout Inventory establish a network of interactive relationships between the themes. Finally, we assessed the consistency of the research findings using the joint display method, categorized into three situations: confirmation, where results from both sources reinforce each other; expansion, where results from both sources extend each other; and discordance, where quantitative and qualitative research results contradict each other.

Results

Quantitative results

A total of 1194 individuals completed the quantitative survey, out of which 1054 were valid responses (88.27% validity rate). The criteria for a questionnaire to be considered valid is that the answering time for completing all questions exceed 200 s. The participants comprised 299 males and 755 females, with an average age of 21.20 ± 1.74 years. (The demographics are shown in Appendix 5.) Table 1 presents the average scores for all scales. Interns' score of SAS-4 scoring significantly higher than other SAS scales, indicating an overall state of interns' PIF were at Stage 4. For mental resilience, the score was 59.63 ± 14.70 , and for occupational burnout, it was 56.23 ± 14.36 . The analysis of group comparisons is displayed in Table 2, shows that interns who have received scholarships, had a consistent mentor during internship, have clear career plans, and come from higher-income families were main long-term influential factors, which impacted 3 or more PIF stages. Gender was a significant factor influencing SAS-3 and SAS-h scores (P < 0.05), with males scoring significantly higher than females on SAS-3, but lower on SAS-h. The effects of major and educational level were only evident in SAS-3. Students from lower-income families scored higher in SAS-3, but significantly lower in SAS-4 compared to their higher-income counterparts. Interns who had received scholarships, had a designated mentor, and clear career plans scored higher in advanced scales (SAS-4, SAS-h) but lower in SAS-2 compared to their control groups. As shown in Table 3, scores for mental resilience positively correlate with DS, SAS-4, and SAS-h, and negatively correlate with SAS-3; scores for occupational burnout positively correlate with DS and negatively correlate with SAS-2 (Detailed results are shown in Table 1).

Integration of quantitative and qualitative results

A total of 25 participants took part in 7 focus group interviews and 3 individual interviews to reach data saturation (the demographics are shown in Appendix 5). Seven common themes (interpersonal factors, social factors, internship experiences, sense of burnout, mental resilience, active engagements, career planning shift) were identified from the interviews. We integrated the seven common themes and influencing factors identified

Table 2 Comparison of professional identity scores among different populations

Item	N	SAS-2		SAS-3		SAS-4	SAS-h		DS		
		Mean (SD)	P Value	Mean (SD)	P Value	Mean (SD)	P Value	Mean (SD)	P Value	Mean (SD)	P Value
Gender			0.052		0.011		0.066		0.042		0.731
Men	299	3.81(0.53)		3.44(0.58)		5.19(1.05)		4.84(0.79)		64.15(7.27)	
Women	755	3.87(0.54)		3.35(0.56)		5.32(1.00)		4.95(0.71)		64.15(7.72)	
Major			0.073		0.016		0.118		0.069		0.102
Clinical Medicine	227	3.77(0.56)		3.32(0.56)		5.29(1.03)		4.94(0.75)		65.18(7.77)	
Pharmacy	38	3.95(0.45)		3.42(0.45)		5.16(0.99)		4.82(0.60)		62.82(6.81)	
Imaging	162	3.93(0.53)		3.37(0.54)		5.36(1.03)		5.00(0.75)		63.07(7.88)	
Stomatology	150	3.89(0.55)		3.25(0.60)		5.46(1.08)		4.99(0.71)		64.23(7.43)	
Testing	132	3.83(0.60)		3.39(0.48)		5.29(0.93)		4.98(0.70)		64.31(7.86)	
Rehabilitation	251	3.85(0.51)		3.48(0.60)		5.15(0.98)		4.80(0.75)		63.97(7.71)	
Optometry	44	3.75(0.40)		3.37(0.56)		5.28(1.04)		4.94(0.75)		65.36(5.68)	
Traditional Chinese Medicine	28	3.85(0.59)		3.36(0.58)		5.27(1.14)		4.99(0.84)		63.93(7.67)	
Medical Records Management	2	4.45(0)		3.33(0.94)		4.00(0)		4.42(0.12)		54.50(4.95)	
Nutrition	20	3.91(0.31)		3.61(0.48)		5.15(0.96)		4.63(0.68)		63.25(4.52)	
Educational Level			0.107		0.002		0.634		0.637		0.588
First-tier Undergraduate	125	3.74(0.58)		3.22(0.52)		5.19(1.03)		4.86(0.74)		64.66(8.37)	
Second-tier Undergraduate	365	3.85(0.56)		3.39(0.58)		5.30(1.00)		4.93(0.76)		64.25(8.24)	
College student	564	3.88(0.51)		3.40(0.56)		5.29(1.03)		4.92(0.72)		63.98(6.95)	
Have Received Scholarship			0.448		0.026		0.004		0.005		0.089
Yes	386	3.84(0.55)		3.32(0.57)		5.39(1.02)		5.00(0.71)		64.48(7.57)	
No	668	3.86(0.53)		3.41(0.56)		5.22(1.01)		4.87(0.75)		63.96(7.61)	
Have Consistent Mentor During Internship			0.349		< 0.001		< 0.001		< 0.001		0.567
Yes	642	3.86(0.55)		3.32(0.56)		5.37(1.01)		4.98(0.73)		64.24(7.71)	
No	412	3.84(0.52)		3.46(0.57)		5.13(1.01)		4.82(0.73)		64.02(7.41)	
Have Clear Career Planning			0.894		< 0.001		< 0.001		< 0.001		0.153
Yes	751	3.86(0.54)		3.34(0.55)		5.41(1.01)		5.00(0.73)		64.26(7.68)	
No	303	3.84(0.53)		3.47(0.59)		4.94(0.97)		4.71(0.71)		63.90(7.37)	
Have Experienced Medical Disputes			0.661		0.249		0.682		0.960		0.222
Yes	91	3.83(0.57)		3.30(0.57)		5.32(1.04)		4.90(0.82)		64.88(8.21)	
No	963	3.85(0.53)		3.38(0.56)		5.28(1.02)		4.92(0.73)		64.09(7.53)	
Family Annual Revenue			0.205		0.001		0.013		0.136		0.060
Less than 50,000	576	3.86(0.52)		3.42(0.56)		5.21(1.03)		4.89(0.75)		63.81(7.28)	
More than 50,000	478	3.84(0.55)		3.32(0.57)		5.36(0.99)		4.94(0.73)		64.58(7.94)	
Have Boy/Girl Friend			0.772		0.386		0.206		0.247		0.440
Yes	295	3.85(0.54)		3.35(0.55)		5.34(0.99)		4.96(0.77)		64.33(7.64)	
No	759	3.85(0.54)		3.39(0.57)		5.26(1.03)		4.90(0.72)		64.09(7.58)	

SD: Standard Deviation; DS: development scale; SAS: stage specific attribute scale; SAS-2: stage 2-specific attribute scale; SAS-3: stage 3-specific attribute scale; SAS-4: stage 4-specific attribute scale; SAS-h: stage 4 and higher-specific attribute scale

in quantitative study by assigning all of them into three dimensions (Person, Environment, and Behavior) of Reciprocal Determinism. '*Person*' refers to interns' occupational burnout and their mental resilience, those two themes were identified by interns from interviews as essential psychological mediators for their PIF, aligning well with the quantitative results that burnout and resilience play different (either positive or negative) roles in developmental stages of PIF (Table 3). '*Environment*' includes social factors, interpersonal factors, and internship experiences: Social factors predominantly focus on pressures from job market and social bias on low educational levels, females, as well as certain majors; Interpersonal factors included career idols, mentors, and relatives working in healthcare organizations, and the influential mechanism of consistent mentor (identified from quantitative results) was further discussed here; Internship experiences put emphasis on major-determined job characteristics and department atmosphere. PI is the center of '*Behavior*', active engagements and shifts in career planning were direct behavioral manifestations of PI, offering insight into how interns' professional selfconcept influences their actions and decisions. The analysis of bidirectional relationship between different were

 Table 3
 Relationship between Chinese interns' mental resilience, occupational burnout and professional identity

Mean Scores of PIF	Mental R	esilience	Burnout	Burnout			
Scales Correlation	Mean	P Value	Mean	Р			
coefficient				Value			
DS	0.076	0.013	0.24	< 0.001			
SAS-2	0.014	0.657	-0.254	< 0.001			
SAS-3	-0.177	< 0.001	0.010	0.754			
SAS-4	0.379	< 0.001	0.036	0.249			
SAS-h	0.343	< 0.001	0.042	0.168			

DS: development scale; SAS: stage specific attribute scale; SAS-2: stage 2-specific attribute scale; SAS-3: stage 3-specific attribute scale; SAS-4: stage 4-specific attribute scale; SAS-h: stage 4 and higher-specific attribute scale; PIF: professional identity formation

achieved by comparing the degree of alignment and disclosure from both studies, to provide a comprehensive view of how different factors interplay in the PI development of medical interns (Fig. 2).

Environmental \rightarrow behavior

Theme 1: interpersonal interactions shape interns' career plannings

Influential experts in the field of medical specialties motivate and inspire interns through their professional accomplishments and ethical standards, motivating them to model their own career paths on the professional competencies and attributes of these figures, and motivating medical interns to align themselves with the values, 'My mom took me to see an old professor of neurology... I really admire his love for this profession... He's almost 80, but he insists on participating in ward rounds at 7:00 a.m. every day and working at the outpatient clinic three times a week... At the same time, he introduced me a lot of things about the inner sanctum... He made me feel that this major (clinical medicine) is worth studying'. (G3P2).

'My Professional idol...is definitely the great Zhong Nanshan... Especially with the 19-year outbreak, he was on the front line and contributed a lot.' (G5P2).

Advice in the pursuit of a medical career from relatives with respectful achievements in related area may significantly influence the career choices of medical interns.

'His advice will affect my career choices over 80%... Their achievements are excellent... It's true that if I'm willing to follow the path that they point to me, I might have reached a height that I couldn't have reached'. (G7P1).

'My uncle's daughter is working in a hospital in Zhumadian... She's very successful...When she came to my house, she would talk to me about how to plan my future. As for influences on the choice of future path... a little bit... Mostly is because she succeeded in this field. What she sees is probably something I would have to go to great lengths to learn.' (G2P2).

Mentors often act as both professional and qualities role models for interns, motivating them to be more



Fig. 2 Reciprocal relationships amongst behavior (PI), person (emotional responses including resilience and occupational burnout) and environment (interpersonal factors, social factors and internship experiences) in the process of PIF. 5 directional relationships were identified and represented as arrows labelled with different numbers

dedicated to their studies and internships as interns would like to reach the level of their mentors in the future. Conversely, encounters with mentors who embody less desirable professional attributes can be equally instructive. These interactions may encourage interns to critically evaluate and consciously avoid certain behaviors or attitudes, shaping their professional development in a contrasting but equally important manner.

'I feel like it's just awesome to be his position at his age...I kind of aspire to be like him... I want to move on to the next educational level - undergraduate, postgraduate, then PhD if I'm able to do so. And finally become a successful person like him'. (G1P4).

'I feel that the teachers are very good in all aspects... I think I still need to learn more about their personalities... to learn the way teachers communicate patients' (G7P2).

'No, I don't want to be like him, I feel that his works are particularly boring and dull'. (G7P1).

Theme 2: social bias on educational level and gender result in career planning shifts

Interns with lower educational level may find themselves constrained to seek employment opportunities, which may compel them give up initial career aspirations and find jobs that correspond directly with their current level of knowledge and skill sets.

'Many works have basically been sealed for our educational level, now there is only a fixed road, to complete this internship and then participate the project of going to countryside to support... Then when you back you can find a job in our local hospital... The development space is very limited.' (Individual interview 1).

'The hospital previously issued a recruitment announcement, only postgraduate students in our majors can be admitted, is afraid that by the time the undergraduates even don't have a chance to submit a resume'. (G6P1).

The traditional cultural perceptions in China regarding marriage and family responsibilities for females can create significant obstacles for those aspiring to pursue further education and achieve long-term career goals, leading to a delay or even abandonment of their educational and career objectives.

'Public universal value on girls...that if they haven't solved their personal problems by the age of 30... That is... a little bit of failure, but between the age of 25 and 30, we have to finish school, think about work, think about how to form a family, and then get married and have children and so on, and that's probably the two big things in your life that determine the rest of your life, a job and a family, and all have to make a decision within those five years and do it right, and it's really a very difficult thing to do.' (G3P2).

Theme 3: pressures from job market demands influence interns' career choices

Favorable career prospects improve interns' PI to be determined to contribute to this subject, while poor career prospects make interns continuously change their career planning, reflecting a state of uncertainty and adaptation to changing circumstances.

'This major has a great future...I'd like to find a job in this field as much as possible after undergraduation' (G5P1).

'I think rehabilitation doesn't have a good prospect for development now...the main feeling is that it is all undeveloped now, and then the employment is also quite confused...I don't know in which direction I should go... whether I should pursue a higher education or just work directly?' (Individual interview 2).

The higher demands of scientific research outcomes in current job market compel interns to focus more on 'fastyielding' research rather than clinically oriented research that aligns their initial career goal. Practical-talented students also have to shift their career focus to scientific research. Such a professional environment not only contradicts their original intentions but may also diminish their enthusiasm and expectations for their future careers.

'Nowadays the student training model... A lot of times it's just passive research... I'm not really sure if I'm suited for basic research, but because everyone around me is doing experiments, I'm forced to get involved in the wave... You know that what you come up with doesn't make sense, doesn't have any clinical translational value, it's just a waste of money... but you must do...If you don't do it, you can't write papers'. (G3P1).

'I want clinically oriented research. I want to be a good doctor who can treat patients, not just to be a research machine... Nowadays... It feels like research... is just to make a living. I'm really not sure if I'm suitable for research in the future, but if I want to have a better future, then I'll still do research, and then I'll go for a PhD... In the end, it's... You're forced to make some choices, whether it's because of your family or whatever, and I'm afraid that in the end, you have to give up something, and it's scary. You can't say you're only doing it for just yourself... Only for the sake of the career, only for the sake of your dream... There are a lot of things you must take into consideration.' (G3P2).

Environment \rightarrow person

Theme 4: A good department atmosphere can reduce interns' occupational burnout The characteristics of a work environment including supportiveness from mentors, communication style, and team culture, significantly impact an interns' work experience and emotional response. A positive and supportive environment can foster enthusiasm and engagement, while an oppressive environment lacking in communication can lead to weakened mental resilience and a higher level of burnout.

'Teachers are all very nice to work with... They will teach us all the professional skills and so on, expect us to learn more, let us practice, and also trust us very much... The internship was better than I expected. I love this job. Every day I want to come? (G5P2).

'The working environment is a bit depressing... When go to the toilet, you have to come out and get dressed and walk a long way. People in there don't usually talk or laugh, so it's a bit depressing...And when they make a mistake, the first thing they do is to go and say...ah it wasn't me, so it's a bit of a blame-shifting thing. I don't really like that, I feel like mistakes need to be fixed first thing...I didn't want to stay there, I even cried when I was working.' (G2P3).

Environment \rightarrow person \rightarrow behavior

Theme 5: interns' emotional States influenced by job characteristics significantly contribute to their occupational identity level Internship roles vary by major but generally fall into two categories: those involving direct patient interactions and treatment, and those only focused on repetitive machinery operation without patient contact. These two categories exhibit a clear divergence in terms of PI. The opportunity to directly communicate with patients or being given appropriate autonomy to make treatment decision for patients (Environment) highly improved interns' sense of responsibility and achievement (Person) through the positive feedback on performance and gratitude from patients and families. The improved emotional states inspired interns engaged in their works more actively (Behavior).

'Every day before entering the office from the outside...I would see hope from the patients' family members' eyes... They must have wanted to know what was going on with their loved one in there...and I wanted to help them... Thinking that I want to act more professionally and carefully in the treatment process... To help them return to their lives...to society... Every healthcare worker should shoulder their own responsibility' (G5P2).

In contrast, pharmacy interns who only be assigned to conduct repeated works such as dispensing drugs and do not interact with patients (Environment) tend to have higher level of sense of burnout (Person) and resulted in career planning shift to find jobs outside hospital (Behavior).

It's totally physical work. You don't need a brain to complete this work. It's a job that just anyone can come and do...I regret a little bit to work there... I probably won't be working in a hospital in the future. (G2P3) Additionally, engaging with patients reminds interns of the impact and importance of their roles in patients' treatments, which can significantly mitigate their feelings of occupational burnout that often accompanies repetitive jobs. This aspect underlines the importance of incorporating patient interaction opportunities for the development of PI.

'The work is a little bit dull...it just like assembly line, anyone can do this job. However, I found that if there are patients come to ask the results of blood tests, that kind of time is quite happy...Communicating with patients was quite happy... If my future work is also the process like this and if I could get a basic salary of 4,000 to 5,000, I think that would be acceptable'. (Individual interview 3).

Behavior \rightarrow environment

Theme 6: improved PI made interns actively coping with social bias towards their major I deeply love my major...Especially during the internship, I develop a deep understanding of the importance of rehabilitation in the development of contemporary health care. I want to help dysfunctional patients to return to life, back to society... When I back home, which is in a small county...People don't know much about rehabilitation, they may think you're studying nursing...I would patiently explain to them and it's necessary to let them know what we do. (G5P2) I also think that after they heard about our explanation, they felt that our major is quite good, they want to learn by themselves and give people massage and acupuncture and so on. (G5P1)

Behavior \rightarrow person

Theme7: interns with higher occupational identity show greater resilience to Cope with job burnout Interns who have clear career planning demonstrate more positive attitudes to tedious works.

This professional prospect is very good... At present, I would like to engage in this industry in the future... Most of the interns tended to only do physical work during the internship and forgot their original goal which is to learn more knowledges...I think after you've been skilled in operation, you also have to find out which massage style is suitable for the patient... that is, you keep learning.....you have to use your own brain to think about it. (G5P1)

If you are an intern in the Department of Dentistry, you basically do the same things including root canal fillings, aesthetic restorations and oral mucosal diseases every day...but the medication prescribed is different... And then the treatment steps, the degree of curvature of the root canals, the alignment of the canals may all have some differences and personalized to individuals. It's just... You have to find the fun in the boring right? (individual interview 1)

Discussion

To the best of our knowledge, this study is the first to employ mixed methods to explore the PIF of medical interns within the socio-cultural context of China. Based on Kegan's human developmental model, we positioned the PIF stages of Chinese medical interns, finding that they predominantly reside at stage 4. In comparison, research conducted in Japan using the same scale on 4thyear medical students about to start their clinical clerkships, 6th-year medical students who completed 1.5 years of clinical clerkships, and residents in the final month of a 2-year residency program at Kagoshima University indicated that the average medical student was at stage 3, with a range from stage 2 to 4 [6]. The average instructor was at stage 4 or higher, with few at stage 2 [6]. The average level of PIF among Chinese medical interns is high, which may have some correlation with the medical education and employment model in China, where many interns transition directly into employment upon graduation, necessitating the development of PI during their internship year. Therefore, exploring the influences on the formation of PI during the internship period in medical education is of great value in promoting the development of PIF. Our questionnaire survey identified several long-term influencing factors, including receiving scholarships, having consistent mentorship during internships, and having clear career planning, which impact PIF stages 2, 3, and 4. These factors negatively influenced students at stage 2 but had positive effects at stages 3 and 4. Gender and higher family income were identified as short-term influencing factors. Male students and interns from higher-income families scored higher at stage 3 but lower at stage 4. Different educational levels and majors also influenced the PIF stages differently at stage 2.

Using SCT reciprocal determinism as a framework, our qualitative study delved into various factors affecting the PIF of medical interns, revealing that the bidirectional interactions between personal, environmental, and behavioral factors can explain the multifactorial process of PIF. Environmental factors, including interpersonal relationships and social interactions (mentors, professional role models, employment market pressures, societal biases towards education and gender), can act as facilitators or barriers, directly impacting interns' PI. Interns' emotional states, influenced by job characteristics, serve as indirect determinants of their PI. Additionally, the enhancement of PI (behavior) enables interns to actively cope with societal biases towards their profession (Environment), demonstrating greater resilience (personal) in managing job burnout. Specifically, interpersonal factors such as professional role models, family members already in the profession, and mentors are generally seen as facilitators of PIF, serving as examples for interns to emulate. This aligns with previous research indicating that strong, positive role models, including clinical environment physicians, instructors, and peers, are crucial for medical students' mental health, and establishing relationships with them is essential for success. The education system plays a crucial role in fostering PI. However, higher-educated medical interns displayed more negative PI during interviews, primarily due to the additional research demands imposed by the current job market, placing substantial employment pressure on graduates seeking high-paying jobs. In contrast, most secondary school graduates aim for technical positions with less research pressure, and their university and internship experiences align closely with job content. These findings highlight shortcomings in China's medical education macro policies [26].

The issue of burnout among healthcare workers and medical interns has long been recognized as a significant negative factor. Studies on the relationship between burnout and PIF primarily focus on the interactions between burnout and personal values, health, self-efficacy, or resilience. A recent study by Lorenzo Madrazo et al. on internal medicine residents during the COVID-19 pandemic found that multiple factors influenced residents' PIF, with burnout significantly reducing PI levels [27]. Similarly, Vaa Stelling BE et al. linked burnout with impostor syndrome and academic pressure among early-career medical faculty transitioning from training to unsupervised practice, affecting PIF [28]. Wang et al.'s research also noted the negative moderating role of burnout in doctor-patient communication and medical students' PIF [29]. Both our quantitative and qualitative results reveal the negative impact of burnout on PIF. Interns indicated in the interviews that repetitive work and heavy workloads were significant triggers for burnout. However, appropriate patient interactions act as moderators in the work process, promoting PIF. This implies the need for careful consideration of internship content, balancing "repetitiveness" and "excessiveness." Similar findings in our earlier studies with pharmacy interns and teaching physicians emphasized the importance of appropriately arranging internship content and highlighted existing issues in China's medical internship design. Previous research also suggests that resilience promotes PIF [30, 31], corroborating our findings that resilience plays a crucial role in fostering positive PI development. This underscores the value of this internal strength among medical students, highlighting the need to develop methods that cultivate PI through active engagement and self-directed learning.

Furthermore, our results reveal the significant impact of both micro and macro environments on PIF during internships. At the micro level, a positive departmental atmosphere creates a conducive learning environment and a comfortable internship experience, promoting PIF, and vice versa. From a macro-environmental perspective, the factors affecting medical interns' PIF are more complex and diverse [32]. Firstly, our findings suggest that in China's socio-cultural context, society attaches great importance to the academic gualifications of medical students. The current system of medical specialization in China is not perfect, and medical graduates with low education (bachelor's degree or below) face poor employment opportunities and occupational environments, while the pressure exerted on highly educated individuals far exceeds the normal workload, which affects the occupational identity of people at all educational levels [33]. Additionally, social prejudice against women is also prevalent in China due to the influence of traditional concepts of marriage and family [34]. Those are critical issues that need to be addressed urgently.

This study has several limitations. First, it is a singlecenter case study, and its robustness needs further validation. Future research will involve multi-center empirical studies to provide a more comprehensive explanation of the factors influencing PIF and how their interactions impact PI formation. Second, this study remains a crosssectional study, observing only the initial stages of medical interns' PIF. Our ongoing longitudinal research aims to address this issue, focusing on the "mid" and "late" experiences and PI of medical interns to understand the influence and direction of internship processes and time factors. Lastly, the quantitative survey portion of this study has some deficiencies, lacking clear direction. However, this stage of research provides a foundation for future studies. Our "mid" and "late" surveys will build on the "initial stage" findings, incorporating more targeted potential influencing factors into the questionnaires and interview outlines.

Conclusion

The study was carried out in China, taking into account the social and cultural factors. It was found that the majority of Chinese medical interns in their last year of university were at stage 4 according to Kegan's model of human development. Long-term influencing factors include receiving scholarships, having continuous mentor guidance, and having clear career plans. In contrast, gender and higher family income are identified as shortterm influencing factors, significantly impacting students at specific stages but not consistently over time. Additionally, Bandura's SCT provided a good theoretical framework to illustrate the complex interactions between personal, behavioral, and environmental factors in the PIF. It highlights the critical need to balance these influencing factors during education and internships. This research provides empirical support for optimizing medical education and internship design, thereby enhancing the PI and competence of medical interns.

Supplementary Information

The online version contains supplementary material available at https://doi.or g/10.1186/s12909-025-07199-3.

Supplementary Material 1

Acknowledgements

We are sincerely grateful to all the participants who consented to be involved in this study.

Author contributions

XDJ, JYD, ZMC and ZY contributed to the conception and design of the work, the acquisition, analysis and interpretation of data. XJY, WZ, QFZ, LC, and XYB contributed to data collection.TYX, XDJ, SZD and YHH contributed to the analysis and interpretation of data.ZY, XDJ, JYD, QFZ, XYB and WZ contributed to the drafting of the paper. TYX, XJY, SZD, YHH, LC and ZMC contributed to the critical revision of the paper. All authors approved the final manuscript for publication.

Funding

The work was supported by Henan Medical Education Research Project (WJLX2023016, WILX2024049) and Henan Zhongyuan Medical Science and Technology Innovation Development Foundation Special Fund (ZYYC202301YB).

Data availability

The datasets used during the current study are available from the corresponding author upon reasonable request.

Declarations

Competing interests

The authors declare no competing interests.

Ethical approval and consent to participate

Ethics was approved by the First Affiliated Hospital of Zhengzhou University Institutional Review Board (No. 2022-KY-0736). The studies were carried out in complaince with the local legislation and institutional guidelines. The participants gave written informed consent to be included in this study.

Conflict of interest

The authors declare no competing interests.

Clinical trial number

Not applicable.

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Received: 7 December 2024 / Accepted: 18 April 2025 Published online: 08 May 2025

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