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Exploring influencing factors and facilitating strategies for self-directed learning from the perspective of medical trainees: a multicentre qualitative study in China

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ABSTRACT

Objectives Exploration of influencing factors and promotion strategies for self-directed learning (SDL) is a current research hotspot. However, there is a dearth of relevant research among medical trainees. The objective of the present study was to explore the perceptions of SDL among medical trainees, while also identifying the multidimensional factors associated with SDL and potential facilitating strategies from the perspective of medical trainees.

Design This multicentre qualitative study used focus group discussions to gather insights into SDL, analysed through thematic analysis. NVivo V.12 was used for efficient data management and processing.

Setting Four focus group discussions were held at three large tertiary hospitals in mainland China from December 2022 to July 2023.

Participants This study used purposive sampling to recruit eligible participants from the selected hospitals, primarily through instructor recommendations. Recruitment was further supported by snowball sampling, where trainees who completed the interviews referred additional participants. Medical trainees from three major tertiary hospitals in mainland China were ultimately invited to participate in the study.

Results A total of four focus group discussions were conducted involving 17 medical trainees. Thirteen themes were summarised and assigned into three categories: (1) perceptions of SDL among medical trainees, (2) multidimensional factors affecting SDL among medical trainees and (3) potential improvement strategies.

Conclusion This qualitative study investigated the perspectives of medical trainees regarding SDL across various grades and hospitals in mainland China. The participants universally acknowledged the significance of SDL and expressed a strong aspiration to enhance their competence in this area. The study identified that the factors influencing SDL abilities are multifaceted, highlighting the need for tailored intervention strategies to address these challenges effectively.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The current qualitative study provides a basis for further indepth research on how medical trainees perceive self-directed learning (SDL) abilities and how to promote the development of SDL abilities.
⇒ The multicentre design enhances the credibility and generalisability of the research findings.
⇒ The diverse professional backgrounds and experiences of participants provide multiple perspectives, enriching the breadth of the research.
⇒ The limitations of small samples make it difficult to ensure universal applicability across all medical contexts.

INTRODUCTION

Medical professionals must be lifelong learners.[1] Therefore, self-directed learning (SDL) is a core competency that they must master.[2] One of the most widely accepted definitions of SDL was proposed by Knowles in 1975:

> a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes.[3]

SDL is often confused with self-regulated learning (SRL) because both concepts describe how learners proactively set goals, choose and implement appropriate learning strategies and evaluate learning outcomes. However, SDL and SRL are distinct; they represent two different components of lifelong learning. SDL encompasses a wide array of learning methods learners employ, while SRL focuses on the critical learning processes associated with specific tasks. Effective SDL necessitates the integration of various key SRL processes to achieve set objectives.[4] Our research team previously conducted

preliminary investigations into the SDL motivations[5] and strategies of hospital pharmacy interns,[5] revealing that standardised training serves as a crucial phase in the transition of clinical medical students from academic learners to professional healthcare practitioners, as well as a vital period for enhancing core competencies like SDL. Since 2014, China has introduced a standardised residency training system that mandates all newly appointed clinical doctors with a bachelor's degree or higher to undergo systematic training at teaching hospitals before assuming clinical positions. This training emphasises essential competencies, including clinical skills and SDL.[6] However, there is still insufficient research on SDL among medical interns, particularly regarding the influencing factors and enhancement strategies within the Chinese cultural context.[7] How to cultivate and enhance the SDL competencies of medical trainees is a critical issue that needs to be addressed.

Several studies have summarised the factors affecting SDL, including personal, family, environmental and cultural factors.[8] A cross-sectional study in China found that individuals' self-confidence, passion for the profession, clarity of learning goals, academic performance, mastery of learning methods, utilisation of learning resources, as well as age, gender and family income are all significantly correlated with the level of SDL competence.[9] Similarly, a qualitative study from Canada found that personal factors affecting SDL included changes in motivation, personal characteristics and approaches to SDL over time. Environmental factors influencing SDL included the influence of the structure and culture of the residency training programme and the presence of contextual barriers.[10] Meanwhile, a recent study has also emphasised the impact of curricula on SDL.[11] However, there is controversy about the factors affecting SDL, and the conclusions drawn from different studies are contradictory. First, different studies have different conclusions regarding whether age is significantly correlated with SDL.[12] Similarly, one study notes a significant correlation between academic achievement and SDL,[9] while another study concludes that there is no significant relationship between the two.[13] In addition, there is strong evidence that cultural factors significantly influence students' SDL proficiency.[14] Therefore, it is necessary to further explore the factors influencing medical students' SDL, taking into account sociocultural and national background.

How to improve SDL is another important topic of concern for researchers. The fact has been noted that learners progressively improve their SDL competencies by setting learning objectives, using resources, applying knowledge and assessing learning outcomes.[15] With the rapid progress of society, young people's attitudes towards life and culture change accordingly, in turn affecting their motivation to learn. In addition, with the continuous updating of information technology, multimedia platforms such as TikTok and YouTube are becoming fully integrated into every aspect of learners' lives, affecting their selection and utilisation of learning resources.[15] In the macro context of China's continuous promotion of comprehensive healthcare system reform, the social value and professional identity of medical personnel are also changing, affecting these learners' assessment of the effectiveness of their learning.[16] Therefore, examining how to enhance the SDL capabilities of medical interns through their personal experiences in learning, life and professional development is a valuable endeavour.[17] As previously discussed, the factors influencing SDL capabilities are complex and marked by uncertainty, with sociocultural contexts contributing to variations in SDL practices. It is widely recognised that China's sociocultural environment is distinctive, characterised by significant differences in family educational approaches and medical education systems, compared with those in developed Western countries.[18] Hence, we conducted this study to address the following three questions:

1. How do medical trainees perceive SDL?
2. What factors influence SDL?
3. How can we improve SDL among medical students in training?

METHODS

Design

Most of the previous cross-sectional survey studies on the influencing factors of SDL have used quantitative surveys.[19] Taking into account the influence of sociocultural and national background differences on the research topic, this study adopts an interpretive qualitative research approach to allow participants to freely articulate their perspectives and experiences throughout the research process. Additionally, this design captures the nuances of participants' changes and adaptations across various contexts, ultimately enriching and deepening the understanding of the research topic.[20]

Written informed consent was obtained from all the study participants.

Sampling and recruitment

The recruitment method used in this study was purposive sampling in order to obtain participants who were representative of a variety of respondent characteristics. Participation criteria were set as follows: (1) participant has received standardised medical training at the sample hospital; (2) participant's professional background included clinical medicine and clinical pharmacy; (3) participant has completed at least 3 months of standardised training; and (4) participant volunteered to participate in the study. Based on the principle of convenience, we selected three medical institutions.[21] The sample hospitals were the First Affiliated Hospital of Zhengzhou University, Henan Provincial Cancer Hospital and West China Hospital of Sichuan University, all of which are top large-scale comprehensive teaching hospitals in mainland China. The first two hospitals are situated in Henan Province, located in Central China, while the third is nestled in Sichuan Province in Western

China. Both provinces boast significant populations of approximately 100 million. Each of these three hospitals stands as a leading medical institution in their region, together admitting around 500 medical trainees annually. Participants were recruited by research team members (XD and ZY) at each of the three hospitals. The study primarily used purposive and snowball sampling for participant recruitment. Through purposive sampling, the researchers first engaged with the instructors or faculty members to explain the research objectives and inclusion criteria. Based on this information, the instructors or faculty members identified and recommended suitable participants. In addition, snowball sampling was implemented, where existing participants, guided by the research goals and inclusion criteria, referred potential candidates. There were no direct conflicts of interest between the researchers and the participants.

Data collection

All four focus group discussions were completed using a face-to-face format. Before the formal interviews, the researchers communicated with the medical trainees the purpose of the study, the format of the interviews and the time of the interviews. At the same time, the researchers stated in detail the participants' rights and privacy protection issues. For example, the interviewees could choose to stop the interview at any time, and the researchers also anonymised the participants' personal information. All focus group discussions took place between December 2022 and July 2023 and were moderated by interviewers (XD and ZY) who have experience in qualitative research. All interviews were digitally audio-recorded and transcribed with the consent of the participants. In this study, the development of the interview guide followed a progressive approach. Initially, the researchers (XD and ZY) clarified the research objectives and key questions and subsequently reviewed relevant literature to gain a deeper understanding of the research context. Following this, XD and ZY drafted a set of preliminary open-ended questions and sought feedback from two experts to refine the guide. A pilot interview was then conducted by XD to evaluate the clarity and feasibility of the questions, leading to further revisions based on the insights gained. It is important to note that during the interviews, the researchers used the guide as a framework while maintaining a degree of flexibility, dynamically adjusting the questions in response to participants' answers to ensure a comprehensive collection of valuable data. The interview guide consisted of the main questions shown in box 1.

The criterion for determining data saturation in qualitative research is that 'no new themes or codes emerge from the interviews'.[22 23] In this study, after the researchers have completed the fourth focus group discussion, no additional information surfaced during the interviews, leading to the conclusion that data saturation had been successfully achieved. After each focus group discussion, the research team sent the transcripts of the interviews to the participants after they had been organised and invited them to add written statements to the interviews. Among the 17 participants, 5 provided additional information in writing.

Data analysis

The researchers used thematic analysis to analyse the data after the initial compilation of the transcripts of the focus group discussions and the additional written statements from the participants. NVivo V.12 software was used to manage and analyse the data. Interviews were transcribed verbatim. Two authors (XD and ZY) first thoroughly reviewed the interview transcripts to familiarise themselves with the data and document initial impressions. Subsequently, they conducted preliminary coding by identifying and tagging meaningful segments or phrases. Similar codes were then grouped together to form potential themes. The researchers reviewed and refined these themes to ensure they accurately reflected the data. Through iterative discussions, consensus was reached, and redundant or irrelevant themes were removed. Based on this process, the researchers defined the core content of each theme and assigned appropriate labels. Detailed steps in data analysis are described in figure 1. This study is reported following the Consolidated Criteria for Reporting Qualitative Studies checklist[24] (online supplemental material S1).

Patient and public involvement

None.

Reflexivity

It has been recognised that researchers' backgrounds, values and experiences may influence the research process and outcomes, particularly in data collection, analysis and interpretation. Therefore, to enhance the robustness of the study, the researchers approached the process from the following points: (1) the researcher focuses on capturing participants' authentic voices from their perspectives; (2) XD, a second-year clinical medical trainee, tends to interpret themes related to SDL from the standpoint of their own practice, while ZY, a clinical pharmacist and departmental manager with 10 years of experience, emphasises theoretical and experiential perspectives in their interpretations; and (3) the research team has consistently prioritised the protection of participants' privacy and the lawful use of data.

Box 1 Interview guide questions

⇒ Question 1. How do you understand or perceive SDL as a clinical medicine trainee and what do you think is the importance of SDL?
⇒ Question 2. From your practical experience of learning and living, what factors do you think influence your ability to perform SDL?
⇒ Question 3. What difficulties have you encountered in carrying out self-directed learning? How were they overcome?
⇒ Question 4. How do you think SDL can be developed and enhanced?

SDL, self-directed learning.

RESULTS

Thirteen common themes were identified from the interviews and were subsequently assigned into three distinct categories (medical trainees' understanding of SDL, multidimensional factors influencing medical trainees' SDL and potential improvement strategies) to provide a comprehensive understanding of the medical trainees' perspectives on SDL (figure 2).

Demographic characteristics and teaching experiences of HPPs (Health - Professional Personnel)

The study included 17 medical trainees and their demographic characteristics are shown in table 1. Nine of the participants were female and eight were male. 13 participants were clinical medicine majors and 4 were clinical pharmacy majors. The mean age of the participants was 26.66 years (SD=3.70), and the mean duration of participation in standardised training was 1.08 years (SD=0.24). All of them had a bachelor's degree or higher.

Medical trainees' understanding of SDL

Lack of cognition

Participants in this study stated that their understanding and knowledge of SDL were inadequate. Several participants indicated that they did not have a clear understanding of the concept of SDL and there was no teacher who specifically instructed the development of SDL competencies.

> Yes, we have a gut feeling that it's just…just such a thing, but it's not really clear how to interpret it. (G1P4, male physician)

> We have never learned this concept in detail, and there were no instructors who specialized in teaching this area. (G4P1, male physician)

> That means learning on your own initiative, not passively. (G3P4, female physician)

> The perception about it was a little bit fragmented before. (G2P4, female pharmacist)

> When I was in school, my teacher said that I must learn on my own, to know how to learn by myself… Is that what this means? (G2P2, male pharmacist)

High level of acceptance

However, all participants were very cognizant of the importance of SDL. Combined with their roles as technical professionals in the healthcare industry, the participants were even more cognizant of the importance of SDL.

> It's really important. (G4P1, male physician)

> I believe that having the capacity to learn on your own is crucial for a career like ours. It is essentially self-taught because no one will educate you at a later stage. (G1P2, female physician)

> It's especially like how we work clinically, it's lifetime learning and constant learning. (G4P4, female physician)

Self-evaluation

The participants in this study assessed their level of SDL, with the majority of participants indicating a lack of SDL competence.

> Just medium, or a little below medium, and somewhat weak. (G3P2, male physician)

> I can only achieve a passing score, just sixty (Full marks are 100). (G4P1, male physician)

> umm…I feel like I'm failing this one because I'm not good at identifying problems or communicating with others. (G4P2, male physician)

Multidimensional factors influencing medical trainees' SDL

Participants in this study mentioned that the factors affecting their SDL competence were multidimensional, including personal factors, interpersonal factors, family factors, career-related factors and social factors.

Personal factors

Learning habits, personality and interests were clearly identified by medical trainees as significant personal factors influencing their SDL.

Learning habits

The interviewees pointed out that forming healthy learning habits from a young age can significantly influence one's ability to engage in SDL later in life. Early interventions including parental and teacher encouragement, structured routines and the development of independent learning skills are crucial components in this process.

> It's crucial, in my opinion, to develop this behavior at an early ages. (G3P1, male physician)

> As for children, the main thing is the encourage and rewards from teachers and parents. (G1P1, male physician)

> When you get home from school, you usually do your homework first. For instance, if you get home from school at 5:30, you might finish homework at 6:00 or 7:00. After that, you eat dinner, watch anime at 8:30, take a bath, and then get ready for bed. (G3P3, female physician)

> When we were in high school, our teachers encouraged us to take the initiative to prepare before class and then to revise afterward. (G1P2, female physician)

> Because if you don't have someone to supervise you at university, you're expected to be a bit more capable of learning on your own. (G3P2, male physician)

> I'm telling you, habit formation may start at a young age. (G1P2, female physician)

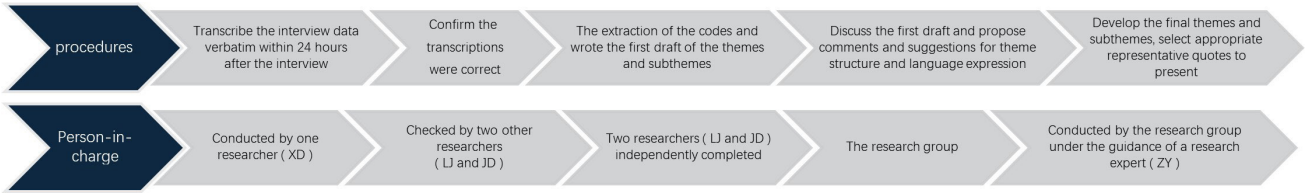

Figure 1 Steps of the thematic analysis.

Personality

Participants emphasised the important role of personality in shaping one's learning behaviours. People with higher resilience and consistency exhibit a stronger propensity towards SDL, while those with desireless personality traits tend to have less motivation for SDL.

> How strong you are inside…may play a moderating role in the middle. (G1P2, female physician)
>
> I think specifically if it's such a desireless personality… Or a more Buddhist personality would have less of a drive to learn. (G4P4, female physician)
>
> Consistency is very important for learning. (G4P1, male physician)
>
> Here's another one. There's a girl in our section… People think she is too persistent and stubborn on certain things, but in fact, if you are persistent and stubborn too much, you'll get something out of it. (G1P1, male physician)

Interests

Medical trainees also identify interests and curiosity in learning and knowledge acquisition as contributors of SDL.

> Well, this is important to this, right? He's just curious, curious. (G3P2, male physician)

Family factors

Family factors affirmed by the participants included the long-term influence of the original family, the family education atmosphere and the presence or absence of family support.

Encouragement from the family of origin

Participants emphasised that positive support and parental affirmation can facilitate SDL by inspiring a person's desire to learn and succeed. Conversely, criticism can lead to a decrease in motivation and even cessation of the learning process.

> The more she supports you, the more you want to learn; yet, if he criticizes you, you'll slack off and quit learning. However, once he affirms you, you feel like you're succeeding; and if someone else affirms you later on, you become even more inspired. (G3P3, female physician)

Family education atmosphere

Additionally, the important role of a cheerful family education atmosphere in shaping SDL is highlighted by participants.

> I'm gonna get you out of here, even if I have to break the bank. (G4P1, male physician)
>
> It is instilled in the family of origin that you can only go to school. Don't think about anything other than school. (G1P3, female physician)

Family support

It is noteworthy that the conducive environment and supportive relationships provided by family members also play essential roles in balancing the demands of parenthood and career aspirations and are facilitators of SDL.

> She was the first clinical pharmacist to come out and, uh, she was a mother of two and they were both very young, and she said that she was the only one with the two children in the middle of the night… Her husband is a busy salesman, so he was basically out of town. She said she was under a lot of pressure. (G4P1, male physician)
>
> You study well there and I'll take care of the kids for you, including my mother-in-law and husband, who are all very supportive. I think it certainly has something to do with it. (G4P4, female physician)

Interpersonal factors (supervisors, classmates, colleagues, parents, leaders)

In addition, the medical trainees stated that their mentors, parents, leaders, classmates, coworkers and

Figure 2 Categories and themes extracted from the qualitative results. SDL, self-directed learning.

other peripheral people had significant influences on their SDL.

> My mentor was the deciding factor for me, and I went in whichever direction he told me to go. (G3P2, male physician)

> It's because there's no one in my hostel, everyone is in the library and I'm bored in my hostel by myself, so I go to the library. (G3P3, female physician)

> He has been continuously learning, but what goes around comes around, and he is currently developing really quickly. Everyone is currently recognizing him and promoting him as a model. (G1P3, female physician)

> What about our family? Well, I think my dad is quite a good independent learner, he likes to delve into this kind of stuff on his own, he's interested and I would have wanted to move closer to him. (G2P2, male pharmacist)

> The leader can then declare, "I'm going to achieve this goal…" He makes a point of pressing the objective below; if your aim's equivalent arises at this time, you must comply, you understand. (G1P4, male physician)

> Yeah, I also think it's affecting results. It's whether or not there's any corresponding effect after you've done it. (G3P4, female physician)

Occupation-related factors

Regarding the influential role related to career development, participants claimed that professional identity and career acquisition are facilitators of SDL enhancement, while job burnout is a negative factor for SDL development.

Burnout

Participants emphasised that the sense of burnout due to monotonous tasks and the loss of novelty in work can significantly dampen the motivation to engage in SDL, as the lack of excitement and interest can discourage the pursuit of new knowledge.

> I was, at the time, just starting out, and my job was simply picking up medication, which was very boring, and I didn't want to learn at all. (G3P4, female physician)

> When you initially start a job, that time is particularly energizing and exciting because you're doing all the work stuff that you haven't done before. At that time, you feel the need to work and the need to learn. But as soon as you become accustomed to it, you start to feel bored and lose interest in learning. (G4P3, female physician)

Professional identity

Conversely, a more robust professional identity was identified to play a crucial role in fostering commitment to continuous SDL in one's field.

> I think this also has something to do with the nature of the job, you know, like I'm a clinical pharmacist, so I'm probably going to consultation every day, and I love it, so I'm constantly learning. (G2P2, male pharmacist)

> In fact, I wanted to study medicine when I was in high school. Well, when I was a sophomore, I felt that I should start learning myself. (G1P3, female physician)

Professional accomplishment

Some participants mentioned that perceiving the value of their skills in making a difference in the lives of others can be a significant source of intrinsic motivation for SDL.

> When I believe that my knowledge is helpful, that my career is always assisting patients and other things, I feel valuable. That greatly encourages me to learn. (G3P1, male physician)

Social factors

Finally, factors such as living stress, social opinion and life goals were also influential factors stated by the participants.

Pressure of living

Interviewees emphasised that the pressure of living, including keeping up with rapidly changing fields, securing future job prospects and escaping the monotony

Table 1 Demographic characteristics of medical trainees (N=17)

Demographic characteristics	Value
Gender	
Male	8
Female	9
Age, years	
Mean±SD	26.66±3.70
Years of participation in standardised training	
Mean±SD	1.08±0.24
Hospital grade	
Grade IIIA*	17
Educational level	
Bachelor	4
Master	8
Doctorate	5
Specialty	
Medicine	13
Pharmacy	4

*A tertiary grade A (grade IIIA) hospital in China is a large medical institution with advanced medical technology, comprehensive service capabilities and the capacity to undertake medical education and research, typically serving as a national or regional healthcare centre.

of menial tasks, can serve as a driving force for individuals to engage in SDL. This also underscored the necessity of continuous learning in today's fast-paced world.

> According to what he just said, medical knowledge is updating quickly; if we stop learning, we will be out of date. So, we must learn, haha. (G2P3, female pharmacist)
>
> Social factors are mainly, for example, it has been said before that if you do not study well, you will have difficulty finding a job in the future, and similar problems may arise. (G2P1, male pharmacist)
>
> If you don't study hard, you feel like you're doing all these menial tasks every day, all repetitive, all wasting time. Well, that's the kind. Definitely, we need to learn. (G1P5, female physician)

Social consensus

Nowadays, the internet enables individuals to showcase their learning accomplishments, garnering reputation and recognition within their professional communities. This phenomenon serves as a significant impetus for individuals to engage in continuous learning endeavours.

> For example, nowadays the internet is more developed, well, including in hospitals, your various achievements are publicized, and it still feels like it affects some of them. (G2P3, female pharmacist)

Life goals

The pursuit of specific life goals, such as gaining admission to a good university, can be a powerful motivator for SDL, leading individuals to invest significant effort in independent study, homework and academic projects outside of regular school hours.

> To get into a good university? I studied hard in junior high and high school, I studied on my own, and I worked hard on my homework and papers when I was home on holidays. (G3P4, female physician)

Potential improvement strategies

Finally, participants in this study also pointed out the problems and directions for SDL improvement in China's standardised training for medical students, including shaping a good learning mindset, rationally formulating and executing a learning plan, applying scientific teaching methods, scientifically evaluating learning outcomes, enhancing communication and upgrading the system.

Shaping a good learning mindset

Participants emphasised that a favourable mindset is the beginning of becoming a successful self-directed learner.

> I think it's finding your point of interest, that is, which area you want to do, which area you're particularly interested in, and you'll be particularly committed to it. That's why it's important to stimulate interest. (G1P5, female physician)
>
> You have to be interested in this, and it's only after you're interested then you're going to get yourself to do this. So, develop an interest. (G3P3, female physician)
>
> Self-directed learning should be an active, organic force. Consequently, it is crucial to cultivate one's own motivation. (G4P2, male physician)
>
> In my opinion, being able to know exactly what you want and having a healthy mental state is also important for self-learning skills. (G1P2, female physician)

Setting goals and implementing them scientifically

During the learning process, learners often break down large goals into more manageable milestones and gradually work towards their completion, and they create a virtuous cycle where they reward themselves for achieving these smaller goals.

> I usually make a plan, but it's harder to stick to a plan in general. (G3P1, male physician)
>
> This is the same as setting aside a space for activities when we make plans. When making plans, including your revision, you definitely need to set aside this free time for yourself! (G4P1, male physician)
>
> If you're going to make a study plan, you'll definitely consider what you're studying overall, your time, etc., all things considered. (G4P1, male physician)

Applying teaching methods scientifically

Participants emphasised the significance of implementing effective teaching techniques, such as collaborative learning methods, interactive teaching methods and using online applications, to promote and enhance active engagement in SDL.

> I still agree with his previous advice to put students in study groups and have them supervise each other, and then let them quiz each other to make learning more effective. (G2P1, male pharmacist)
>
> All use mobile phone software, or APP, and many PCs and mobile phones may use the kind. APP are sometimes used for medical treatment. It is very beneficial for self-directed learning. (G1P1, male physician)
>
> Everyone has a voice, so it doesn't sound like you're listening to a dry lecture. Therefore, I believe that's probably one of the reasons our studies have continued this year. (G2P2, male pharmacist)
>
> In retrospect, it's clear how crucial the instructor's techniques of instruction were. (G2P3, female pharmacist)

Good communication with seniors and teachers

Participants pointed out that establishing regular communications with seniors and teachers and surrounding

oneself with positive influences can be an effective strategy for enhancing SDL.

> Every Wednesday afternoon we discuss what we have learnt, teachers and students together. In fact, discussing this thing is just like forming a group, its biggest advantage is that it can raise everyone's interest. (G4P2, male physician)

> Keep your heart calm and robust by connecting with positive people and things. (G3P2, male physician)

> In retrospect, it was very important to communicate with teachers and classmates. (G1P2, female physician)

Strengthening institutional construction

Moreover, the implementation of a well-regulated system and institutional support is crucial for improving SDL strategies.

> In fact, there is a system that requires us to do so, and there is a system to regulate it, I think. (G2P2, male pharmacist)

> As it stands, we are then rarely educated on such programmes…which are lacking. In my opinion, this needs to be strengthened in terms of institution-building. (G4P4, female physician)

> I think there is a need for the regulation unit to offer a relevant course guide to improve SDL competence. (G4P1, male physician)

DISCUSSION

To our knowledge, this is the first qualitative study to explore SDL among medical trainees in mainland China. The results of this study revealed the knowledge of Chinese medical trainees about SDL and clarified the multidimensional factors affecting the level of SDL among medical trainees. Recommendations for improving SDL competence are also summarised.

The findings of this study reveal that the medical trainees interviewed had a relatively low perceived understanding of SDL and lacked clarity on the distinction between SDL and SRL. This aligns with previous research. A Canadian study found that both students and educators had a narrow and often inaccurate perception of SDL.[25] Similarly, participants in this study rated their own SDL abilities as insufficient, which echoes the results of a cross-sectional study from China. In that study, medical students from five schools in a northeastern Chinese city had an average SDL score of 76.12 (SD=10.96), indicating moderate SDL proficiency among mainland Chinese medical students.[8] A study in Malaysia further highlighted that only half of the surveyed medical students exhibited a high level of SDL readiness.[11] Meanwhile, an Indian study of 87 fifth-semester medical students reported an average SDLRS (Self-Directed Learning Readiness Scale) score of 140.4±24.4, with only 19 students (30%) scoring above 150, indicating generally low SDL scores in the region.[26] Taken together, these studies, along with our findings, underscore the significant gaps in SDL awareness and ability among medical students, emphasising the pressing need for current medical education to strengthen SDL skills. This will better prepare students for the demands and challenges of their future careers. Encouragingly, despite the identified deficits, our participants did recognise the importance of SDL. However, various factors have hindered their ability to fully develop these skills. This realisation prompts us to further explore the diverse influences that shape the SDL capabilities of medical trainees. In light of the rapid advancements and ongoing innovation in the medical field, cultivating robust SDL skills among healthcare professionals is critical for them to successfully navigate the ever-evolving demands of the industry.[27]

This study reveals that the factors influencing medical students' SDL abilities are multifaceted, encompassing personal, familial, interpersonal, professional and societal dimensions, and these findings resonate with those of prior research. Within the realm of personal factors, elements such as study habits, resilience and perseverance, along with interest and curiosity, significantly shape SDL abilities. These findings align with a 2021 systematic review highlighting the effects of personal characteristics, including age, gender and learning strategies.[18 19] Regarding familial influences, the support from one's family of origin and a nurturing educational environment emerge as crucial elements in fostering motivation to learn. This is consistent with existing literature that emphasises the impact of family income and learning resources on SDL abilities.[8] Additionally, interpersonal relationships, specifically support from mentors, peers and leaders, contribute to creating a positive learning atmosphere, echoing the beneficial effects of contextual factors like group discussions on educational outcomes.[18] Professional factors also play a significant role, as a strong sense of professional identity and accomplishment can enhance learning, while professional burnout may diminish motivation.[28] This study further explores these dimensions, particularly focusing on the interplay between professional growth and psychological factors. Finally, societal pressures, the rapidly evolving demands of knowledge and individual goals are pivotal to driving medical students' ongoing SDL, aligning with previous research that discusses the pressures associated with learning environments and future career trajectories.[29] Through focus group interviews, this study enriches the existing body of research by examining previously underexplored process-related factors, such as personal development trajectories, positive psychological feedback and professional influences. These insights shed light on the dynamics of SDL among medical students. For instance, personal development trajectories indicate that learning needs and motivations evolve alongside professional growth. Furthermore, positive psychological feedback, such as recognition from mentors, can invigorate learning motivation, while a strong sense of professional

identity and achievement further nurtures SDL.[30] Collectively, these findings present new avenues for enhancing the SDL capabilities of medical students, particularly in relation to professional development and psychological support.

While extensive research exists on factors influencing SDL, there is a relative dearth of studies on SDL enhancement strategies. Small group learning has been shown to foster learner-centred approaches, boost student motivation and expand learning opportunities.[31 32] Effective small group learning consistently cultivates students' initiative and collaborative skills.[33] In nursing, systematic reviews indicate that individual and group learning strategies, with robust educator support, significantly enhance SDL.[19] This aligns with our study's findings, where participants highlighted the conducive learning environment created by peers, colleagues and others, emphasising the role of teamwork in improving SDL. Additionally, participants suggested various SDL enhancement strategies based on personal experiences, such as mindset adjustment, goal setting, self-evaluation and judicious use of learning resources.[15 34]Leveraging technological advancements and societal developments, and utilizing learning resources in diverse ways proves to be an effective SDL enhancement strategy. In a previous study by our group, SDL-related learning strategies commonly used by hospital pharmacists included leveraging information resources, applying cognitive strategies, crafting learning plans and using learning platforms.[15] Notably, some studies have noted a decline in students' SDL ability as the school year progresses.[26] This may be related to personal motivation[35] or burnout.[36] In this study, participants also mentioned the significant influence of career development factors on SDL.[37] Therefore, mitigating burnout and enhancing medical trainees' sense of career progression and professional identity emerge as effective measures to bolster SDL.

The results of a mixed-methods study from India showed the prominent role of curriculum on SDL readiness,[12] with another study from the Netherlands also emphasising the importance of curriculum on SDL.[38] Participants in our study noted that China's standardised training system overlooks SDL's importance and lacks relevant content and standardised curricula. This prompts reflection on the gap between China's system and those of developed countries. For example, the residency training system in the USA, established over a century ago, has evolved into a mature and standardised framework. The Accreditation Council for Graduate Medical Education, founded in 1981, mandates residents to be trained and assessed across six core competencies.[39] After graduating from medical school, medical students in the UK are required to complete a three-stage systematic training programme that encompasses professional knowledge, professional skills and core competencies before qualifying as a specialist. The standardised training curricula in both countries contain the development of core competencies such as SDL.[40] In comparison, China's standardised training system started relatively late and has been established since 2014. Its training content is still relatively imperfect, mainly focusing on the cultivation of clinical skills and clinical knowledge, while the cultivation of core competencies such as SDL is relatively lacking.[41] Moreover, our previous study revealed that hospital pharmacy interns exhibited inadequate motivation for SDL and low SDL competence. Hence, Chinese policymakers should prioritise the inclusion of core competencies like SDL in the standardised training curriculum.

The strengths and weaknesses of our study deserve attention. This study's strengths include the use of face-to-face interviews, which offered deep and nuanced insights into medical students' views on SDL, and it provides a basis for further indepth research on how medical trainees perceive SDL abilities and how to promote the development of SDL abilities. The multicentre design strengthened the rigour and transferability of the findings. The participants' diverse professional backgrounds also contributed valuable perspectives, enriching the study's scope. However, several limitations should be noted. First, participants' limited awareness of SDL and potential confusion between SDL and SRL may have led to conceptual ambiguity. Meanwhile, the small sample size restricts the generalisability of the results, limiting their broader application. Additionally, the study is somewhat imbalanced due to a higher proportion of participants from the medical field compared with the pharmaceutical field. To address these limitations, future research should employ mixed-methods approaches to provide a more comprehensive understanding of medical trainees' SDL awareness, factors influencing their SDL abilities and potential interventions.

CONCLUSION

This qualitative study explores the views of medical trainees on SDL from different grades and hospitals in mainland China. The participants of this study stated that their understanding and knowledge of SDL were insufficient, and most of them reported lack of SDL competence; however, they recognise the importance of SDL and desire to improve their SDL competence. The factors affecting medical trainees' SDL competence are multidimensional, and targeted intervention strategies should be developed.

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