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Factors Influencing Empathy in Clinical Medical Education

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Research Article

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Abstract

Background: Empathy is a fundamental professional competence in medical education, yet evidence suggests that empathy development may stagnate during medical training. Emotional intelligence and self-efficacy have been proposed as important psychological predictors of empathy; however, their relative roles across different stages of medical education remain unclear.

Methods: This study employed a two-wave cohort design to investigate empathy development among undergraduate clinical medicine students in China. Participants completed validated measures of empathy, emotional intelligence, and self-efficacy during the early stage of training and again in the later stage. Descriptive analyses, group comparisons, and multivariate regression models were used to examine developmental changes and the relative contributions of emotional intelligence and self-efficacy to empathy.

Results: Empathy levels showed only modest improvement across training stages. Emotional intelligence demonstrated a stable and significant positive association with empathy at both time points, whereas self-efficacy showed weak and inconsistent effects after controlling for emotional intelligence. Among emotional intelligence dimensions, emotional perception and emotional regulation emerged as the strongest predictors of empathy. In addition, gender and rural–urban background were associated with differences in empathy levels and the strength of these relationships.

Conclusions: The findings indicate that emotional intelligence, rather than self-efficacy, plays a central role in empathy development among medical students. These results suggest that confidence-based educational approaches alone may be insufficient to foster empathic competence in emotionally complex clinical contexts. Integrating emotional intelligence–focused training into early medical curricula may provide a more effective pathway for supporting sustainable empathy development in medical education.

1. Background

Empathy is widely recognized as a core professional competency in medical education, playing a crucial role in doctor–patient communication, clinical decision-making, and patient satisfaction. Empirical evidence consistently shows that higher physician empathy is associated with improved treatment adherence, better clinical outcomes, and reduced medical disputes[1]. Despite sustained reforms in medical curricula and increasing attention to medical humanities, numerous studies have reported stagnation or even decline in empathy as students progress through clinical training, a phenomenon often referred to as the “empathy erosion” effect[2–3].

Understanding the psychological mechanisms underlying empathy development in medical students has therefore become a central concern in contemporary medical education research. Among the individual-level factors examined, emotional intelligence (EI) and self-efficacy (SE) have received particular attention. However, existing findings remain fragmented, and the relative roles of these constructs in shaping empathy—especially across different stages of medical training—are not yet fully understood.

Emotional intelligence and empathy

Emotional intelligence refers to the capacity to perceive, understand, regulate, and utilize emotions in oneself and others. In clinical contexts, EI enables medical students to recognize patients' emotional cues, manage their own emotional responses, and engage in emotionally appropriate communication[4]. Prior research has consistently demonstrated positive associations between EI and empathy among healthcare students and professionals, suggesting that EI may function as a proximal psychological resource that directly supports empathic engagement[5].

Theoretical models of EI emphasize emotion-related information processing as a core mechanism linking EI to social functioning. From this perspective, empathy is not merely an attitudinal disposition but an emotionally grounded capability that depends on effective emotional perception and regulation. Accordingly, EI—particularly its components related to emotional perception and regulation—may serve as a key driver of empathy development during medical training [6].

Self-efficacy and its boundary conditions

Self-efficacy, defined as individuals' beliefs in their capability to organize and execute actions required to manage prospective situations, has been shown to predict academic performance, learning engagement, and professional identity in medical education[7]. High self-efficacy may increase students' confidence in handling clinical tasks and interpersonal challenges. However, evidence regarding its role in fostering empathy is mixed[8–11].

Unlike EI, which is intrinsically emotion-oriented, self-efficacy is primarily task- and performance-oriented. In emotionally complex clinical encounters—such as those involving patient suffering, uncertainty, or conflict—confidence in one's abilities alone may be insufficient to elicit empathic understanding[12]. This suggests that self-efficacy may function as a distal and context-dependent factor in empathy development, exerting its influence only under certain emotional or situational conditions[13–14].

Developmental perspective and cultural context

Most prior studies have examined EI, self-efficacy, and empathy using cross-sectional designs, limiting insight into how these constructs evolve across different stages of medical education[15–16]. A developmental perspective is particularly important in medical training, where students transition from classroom-based learning to emotionally demanding clinical practice [17–19].

Furthermore, cultural and contextual factors may shape the ways in which psychological resources translate into empathic behavior. In collectivist societies such as China, emotional socialization, family structure (e.g., only-child status), and rural–urban background may influence emotional learning and interpersonal sensitivity. Examining empathy development within this cultural context can therefore contribute to a more nuanced understanding of medical education processes[20–22].

Study aims and contributions

Against this backdrop, the present study investigates the relationships among emotional intelligence, self-efficacy, and empathy in a cohort of Chinese undergraduate clinical medicine students using a two-wave design spanning the early and later stages of training. Specifically, this study aims to:

2. Subjects and Methods

2.1 Research Subjects

The questionnaires were distributed twice to the same cohort of students: first in March-April 2021 (freshmen) and again in March 2024 (senior four). Online surveys were administered to 2020 undergraduate clinical medical students at our university via the Questionnaire Star platform. The first survey collected 378 responses, with 345 valid after excluding those exceeding 120 seconds (91.27% validity rate). The second survey collected 459 responses, with 361 valid (78.65% validity rate).

2.2 Survey Design

The electronic questionnaire included demographic information (gender, age, family economic status, hometown, student leadership roles, only-child status) and three subscales: the Empathy Scale, Self-Efficacy Scale, and Emotional Intelligence Scale.

Empathy Scale[23]: 20 items, 7-point Likert scale, total score 140. Higher scores indicate higher empathy.

Self-Efficacy Scale[24]: 10 items, 4-point Likert scale (From 'completely incorrect' to 'completely correct', they are counted as 1 point, 2 points, 3 points, and 4 points respectively,), total score 40. Higher scores indicate stronger self-efficacy.

Emotional Intelligence Scale[25]: 16 items across four dimensions (emotional perception, emotional control, emotional regulation, emotional application), 7-point Likert scale, total score 112. Higher scores indicate higher emotional intelligence.

2.3 Statistical Methods

Data were analyzed using SPSS 26.0. Descriptive statistics and Pearson correlation analysis were performed ($\alpha = 0.05$). Kaiser-Meyer-Olkin (KMO) tests were conducted: Empathy Scale KMO = 0.904 (both surveys), Self-Efficacy Scale KMO = 0.910/0.916, Emotional Intelligence Scale KMO = 0.889/0.897. Bartlett's sphericity tests were significant ($p = 0.000$).See Table -1 Scale Reliability Analysis.

Table -1 Scale Reliability Analysis

		N=345	N=365
Scale name	items	Kaiser-MeyerOlkin	Kaiser-MeyerOlkin
empathy ability	20	0.904	0.904
Self efficacy Scale	10	0.910	0.916
emotional intelligence	16	0.889	0.897

(Note: N=345 is the first questionnaire scale, N=365 is the second questionnaire scale)

3. Results and Analysis

3.1 Validity and Reliability of Scales

The consistency reliability test method Cronbach's α coefficient was used to analyze the validity and reliability of two questionnaire scales. The Cronbach's α coefficients of the Empathy Scale were 0.773 and 0.626, the Cronbach's α coefficients of the Self Efficacy Scale were 0.859 and 0.919, and the Cronbach's α coefficients of the Emotional Intelligence Scale were 0.893 and 0.916, respectively. The above results indicate that the questionnaire scale 1 of this study has very good validity and reliability, and the questionnaire scale design is reasonable.See Table -2 Scale Reliability Analysis.

Table -2 Scale Reliability Analysis

		N=345	N=365
Scale name	items	Cronbach's α	Cronbach’s α
empathy ability	20	0.773	0.626
Self efficacy Scale	10	0.859	0.919
emotional intelligence	16	0.893	0.916

(Note: N=345 is the first questionnaire scale, N=365 is the second questionnaire scale)

3.2 Basic information of undergraduate students of clinical medicine

Among the 345 undergraduate students of clinical medicine, there are 160 male students (46.4%) and 185 female students (53.6%); aged 17-22 (18.64±0.69) years old; 182 only children (52.8%) and 163 non-only children (47.2%); 196 urban residents (56.8%) and 149 township residents (43.2%); 37 poor families (10.7%), 264 well-off families (76.5%) and 44 wealthy families (12.8%); 160 student cadres (46.4%) and 185 non-student cadres (53.6%).

Among the 365 clinical medicine undergraduate students, there were 78 males (21.37%) and 286 females (78.63%); aged 20-25 (18.64±0.69) years old; 145 were only children (39.73%) and 220 were not only

children (60.27%); 172 were urban residents (47.12%) and 193 were township residents (52.88%); the family economic situation was poor for 74 (20.27%), moderately well-off for 280 (76.71%) and wealthy for 11 (3.02%); there were 155 student cadres (42.47%) and 210 were non-student cadres (57.53%).

3.3 Scores of Empathy, Self-Efficacy, and Emotional Intelligence

The empathy ability score results showed that the average score of the freshman was 4.46 (total score 89.12), which increased to 5.30 (89.72) in the senior year, but the total score increase was not significant ($p=0.12$), indicating that clinical practice has not effectively improved empathy ability, which is consistent with Hojat's "empathy decline" phenomenon. The self-efficacy score results dropped from 2.62 in the freshman year to 2.41 in the senior year ($p<0.01$), which may be due to the accumulation of academic pressure and clinical frustration (Artino et al., 2011). The emotional intelligence score results showed that the emotion application dimension increased significantly (4.88→5.20, $p<0.05$), reflecting that senior students are better at strategic emotion management, but their emotion control ability stagnated (4.60→4.76, $p=0.21$). The correlation between self-efficacy and empathy ability was weakly correlated only in the lower grades ($r=0.139$, $p<0.05$), and was not significant in the higher grades, indicating that the effect of self-efficacy on empathy is mediated by the situation. When students face complex doctor-patient conflicts, self-confidence alone is not enough to drive empathic behavior. Emotional intelligence affects empathy. Emotional perception ($\beta=0.325$, $p<0.01$) and emotion regulation ($\beta=0.344$, $p<0.01$) are key predictors of empathy, supporting Salovey's (1997) "emotion-cognition dual channel" theory.See Table -3 Scoring of Empathy Ability, Self Efficacy, Emotional Intelligence, and Emotional Intelligence in Four Dimensions .

Table -3 Scoring of Empathy Ability, Self Efficacy, Emotional Intelligence, and Emotional Intelligence in Four Dimensions

	(N=345)		(N=365)	
project	Total score	Average score（χ±s）	Total score	Average score（χ±s）
empathy ability	89.12±13.08	4.46±0.65	89.72±8.36	5.3±0.44
Self efficacy	26.18±5.64	2.62±0.56	24.07±5.19	2.41±0.27
emotional intelligence	77.78±13.97	4.86±0.87	81.78±11.86	4.86±0.62
Emotional perception	20.4±4.59	5.1±1.15	22.08±3.46	5.52±0.18
emotion control	18.36±4.65	4.6±1.16	19.02±4.3	4.76±0.22
Emotional regulation	19.52±4.21	4.88±1.05	19.88±3.86	4.97±0.2
Emotional Application	19.49±4.4	4.88±1.1	20.8±3.81	5.2±0.2

(Note: N=345 is the first questionnaire scale, N=365 is the second questionnaire scale)

3.4 Correlation between self-efficacy, emotional intelligence, and the four dimensions of emotional intelligence and empathy in different demographic characteristics

The results show that there is a significant statistical correlation between self-efficacy, emotional intelligence, as well as emotion perception, emotion control, emotion regulation, and emotion application and empathy ($p < 0.01$). From the perspective of gender, except for the insignificant correlation between the emotion regulation dimension and empathy, self-efficacy, emotional intelligence, emotion perception, emotion control, and emotion application all show significant correlations for men ($p < 0.01$). For women, except for the insignificant correlation between self-efficacy and emotion perception and empathy, emotional intelligence, emotion control, emotion regulation, and emotion application all show significant correlations ($p < 0.01$). From the perspective of whether or not they are only children, except for the correlation between emotion perception and empathy, self-efficacy, emotional intelligence, emotion control, emotion regulation, and emotion application all show significant correlations ($p < 0.01$). From the perspective of non-only children, except for the correlation between self-efficacy and empathy, emotional intelligence and the four dimensions of emotional intelligence all show significant correlations ($p < 0.01$). From the perspective of whether or not to be a student leader, except for the correlation between self-efficacy and emotion perception dimensions and empathy, emotional intelligence, emotion control, emotion regulation, and emotion application all showed significant correlations with empathy ($p < 0.01$). Self-efficacy, emotional intelligence, and the four dimensions of emotional intelligence all showed significant correlations with empathy for non-student leaders ($p < 0.01$). From the overall perspective of the students' place of origin, except for the insignificant correlation between self-efficacy and empathy, emotional intelligence and the four dimensions of emotional intelligence all showed significant correlations with empathy. It is worth noting that the emotional intelligence and the correlation between the four dimensions of emotional intelligence and empathy of rural students are generally higher than those of urban students ($p < 0.01$). From the perspective of gender, females have higher empathy ($\Delta=0.68$, $p<0.01$), but weaker emotional control than males ($\Delta=-0.24$, $p<0.05$), which may be related to the discipline of "emotional expression" in the process of gender socialization (Eagly, 2013); from the perspective of urban and rural areas, the correlation between emotional intelligence and empathy of rural students is stronger ($r=0.478$ vs. 0.325), which may be because the rural environment emphasizes collective emotional interaction. See Table-4 Correlation between four dimensions of self-efficacy, emotional intelligence, and emotional intelligence with empathy ability based on different demographic characteristics.

Table - 4 Correlation between four dimensions of self-efficacy, emotional intelligence, and emotional intelligence with empathy ability based on different demographic characteristics N=345

	Self efficacy	emotional intelligence	Emotional perception	emotion control	Emotional regulation	Emotional Application	
category	0.139**	0.395**	0.325**	0.261**	0.344**	0.311**	empathy ability
gender							
Male N=160	0.281**	0.385**	0.350**	0.245**	0.332	0.240**	
Female N=185	0.015	0.413**	0.818	0.274**	0.356**	0.381**	
the only child							
onlyN=182	0.193**	0.322**	0.269	0.195**	0.270**	0.275**	
not merely N=163	0.04	0.497**	0.409**	0.345**	0.442**	0.366**	
student cadres							
Yes N=160	0.118	0.343**	0.301	0.251**	0.348**	0.204**	
No N=185	0.168*	0.450**	0.350**	0.276**	0.343**	0.402**	
Students							
Town N=196	0.13	0.325**	0.263**	0.192**	0.328**	0.244**	
rural area N=149	0.126	0.478**	0.413**	0.337**	0.357**	0.382**	

Note:* P<0.05**P<0.01 N=345 is the first questionnaire scale, and N=365 is the second questionnaire scale.

3.5 Correlation between self-efficacy, emotional intelligence and its four dimensions and empathy

Conduct correlation analysis on the total scores of self-efficacy, emotional intelligence, emotional intelligence dimensions, and empathy ability. The total scores of self-efficacy, emotional intelligence, and various dimensions are positively correlated with the total score of empathy ability, and all have statistical significance (P<0.01). See Table-5 and Table-6 Correlation between Self Efficacy, Emotional Intelligence, and Four Dimensions with Empathy Ability.

Tabl -5 Correlation between Self Efficacy, Emotional Intelligence, and Four Dimensions with Empathy Ability N=345

	Empathy	Self efficacy	emotional intelligence	Emotional perception	emotion control	Emotional regulation	Emotional Application
Empathy	1						
Self efficacy	0.139**	1					
emotional intelligence	0.395**	0.448**	1				
Emotional perception	0.325**	0.205**	0.801**	1			
emotion control	0.261**	0.403**	0.778**	0.476**	1		
Emotional regulation	0.344**	0.429**	0.806**	0.570**	0.510**	1	
Emotional Application	0.311**	0.372**	0.748**	0.452**	0.431**	0.470**	1

Note:* P<0.05**P<0.01 N=345 is the first questionnaire scale, and N=365 is the second questionnaire scale.

Table-6 Correlation between Self Efficacy, Emotional Intelligence, and Four Dimensions with Empathy Ability N=365

	Empathy	Self efficacy	emotional intelligence	Emotional perception	emotion control	Emotional regulation	Emotional Application
Empathy	1						
Self efficacy	0.177**	1					
emotional intelligence	0.248**	0.578**	1				
Emotional perception	0.231**	0.335**	0.780**	1			
emotion control	0.174**	0.466**	0.772**	0.526**	1		
Emotional regulation	0.165**	0.568**	0.805**	0.470**	0.510**	1	
Emotional Application	0.396**	0.396**	0.719**	0.459**	0.333**	0.443**	1

Note:* P<0.05**P<0.01 N=345 is the first questionnaire scale, and N=365 is the second questionnaire scale.

3.6 Regression Analysis of Empathy Influencing Factors

This study uses the total score of empathy as the dependent variable, and self-efficacy, emotional intelligence, the four dimensions of emotional intelligence, gender, whether or not to be an only child, whether or not to be a class leader, and place of origin as independent variables. Through the multivariate linear regression method, the factors that may affect empathy are explored. In the regression model, self-efficacy, emotional intelligence, emotion regulation, emotion regulation, emotion application, gender and other factors are included in the equation. The results show that self-efficacy has a weak effect on empathy, only 13.9% (R2=0.019, F=6.785). After reaching the senior grades, the effect increases, but it is weak, only 17.7% (R2=0.031, F=11.748). However, when self-efficacy and emotional intelligence jointly affect empathy, the effect of self-efficacy is not significant, while the effect of emotional intelligence on empathy is significant, accounting for 41.6% of the influencing factors (R2=0.158, F=32.077). After reaching the senior grades, the effect decreases, accounting for 21.9% (R2=0.063, F=12.35). When self-efficacy, emotional intelligence, and the four dimensions of emotional intelligence affect empathy together, only emotional intelligence as a whole has a significant effect on empathy, and its influencing factors account for 16.4% (R2=0.164, F=13.294). In addition, when self-efficacy, emotional intelligence, emotional regulation, emotional regulation, emotional application, and gender affect empathy together, only emotional

intelligence and gender have a significant impact on empathy, accounting for 17.7% of the influencing factors (R2=0.177, F=12.078). See Table-7and Table-8 Regression Analysis of Factors Influencing Empathy Ability.

Table-7 Regression Analysis of Factors Influencing Empathy Ability N=345

	M0del1	M0del2	M0del3	M0del4
Self efficacy	0.139*	-0.047	-0.049	-0.059
emotional intelligence		0.416***	0.397*	0.432*
Emotional perception				
emotion control			-0.078	-0.093
Emotional regulation			0.069	0.054
Emotional Application			0.034	0.024
gender				-0.113*
Is it an only child				
Growing regions				
R^2	0.019*	0.158***	0.164***	0.177***
F	6.785	32.077	13.294	12.078

Note：*P<0.05；**P<0.01；***P<0.001;N=345 is the first questionnaire scale

Table-8 Regression Analysis of Factors Influencing Empathy Ability N=365

	M0del1	M0del2	M0del3	M0del4
Self efficacy	0.177*	0.05	0.080	0.071
emotional intelligence		0.219***	0.081	0.05
Emotional perception			0.127	0.137
emotion control			-0.034	-0.014
Emotional regulation				
Emotional Application			0.069	0.086
gender				-0.054
Is it an only child				
Growing regions				
R^2	0.031*	0.063***	0.072	0074
F	11.748	12.350	1.061	1.068

Note：*P<0.05；**P<0.01；***P<0.001; N=365 is the second questionnaire scale

4. Conclusions and Recommendations

This study examined empathy development among Chinese undergraduate clinical medicine students and explored the roles of emotional intelligence and self-efficacy using a two-wave cohort design. Three main findings emerged. First, empathy levels showed only modest improvement from the early to later stages of training, supporting prior reports of empathy stagnation during medical education. Second, emotional intelligence consistently demonstrated a significant and robust association with empathy, whereas self-efficacy exhibited weak and inconsistent effects. Third, demographic factors—particularly gender and rural–urban background—moderated the strength of the relationships between emotional intelligence and empathy.

4.1 Emotional intelligence as a proximal predictor of empathy

The most salient finding of this study is that emotional intelligence, rather than self-efficacy, serves as the primary predictor of empathy among medical students[26–27]. Across both waves, EI showed stable and meaningful associations with empathy, with emotional perception and emotional regulation emerging as particularly important dimensions. These results support emotion-centered theories of empathy, which posit that effective empathic engagement depends on the ability to accurately process and regulate emotional information[28–29].

From a developmental perspective, EI may function as a proximal psychological resource that directly enables students to translate emotional awareness into empathic behavior[30]. As students progress into

clinical environments characterized by emotional complexity and interpersonal stress, EI-related competencies become increasingly salient. This may explain why EI retained its predictive power even as self-efficacy declined in later stages of training[31].

4.2 Boundary conditions of self-efficacy in empathy development

In contrast to emotional intelligence, self-efficacy demonstrated only weak associations with empathy, and its predictive effect diminished when EI was included in multivariate models. This finding suggests that self-efficacy alone is insufficient to elicit empathic engagement in emotionally demanding clinical contexts. While confidence in one's abilities may facilitate task performance and learning persistence, it does not necessarily translate into sensitivity toward others' emotional experiences[32].

This pattern highlights an important boundary condition for efficacy-based models in medical education. In contexts where emotional understanding and interpersonal attunement are required, emotion-related competencies may override the influence of generalized confidence beliefs. Conceptualizing self-efficacy as a distal and context-dependent factor helps reconcile inconsistent findings in the literature and underscores the need to integrate emotional competence into models of professional development[33].

4.3 Demographic and contextual influences

The study also revealed meaningful demographic differences in empathy and its psychological correlates. Female students demonstrated higher empathy levels, consistent with prior research on gender socialization and emotional expressiveness. Additionally, the association between emotional intelligence and empathy was stronger among students from rural backgrounds than those from urban areas. One possible explanation is that rural social environments emphasize collective interaction and emotional interdependence, fostering greater sensitivity to others' emotions[34–35].

These findings suggest that empathy development is shaped not only by individual psychological resources but also by broader social and cultural contexts. Medical education programs should therefore consider students' diverse backgrounds when designing humanistic and emotional training interventions[36–37].

4.4 Implications for medical education

The findings of this study have several practical implications for medical education. First, they highlight the importance of integrating emotional intelligence training early in medical curricula, rather than relying solely on clinical exposure to foster empathy. Structured interventions focusing on emotional perception, regulation, and reflective practice may be particularly effective[38–40].

Second, while self-efficacy remains important for academic and clinical performance, educators should be cautious in assuming that confidence-building alone will enhance empathic capacity. Emotional competence training should complement, rather than be replaced by, efficacy-oriented educational strategies[41–42].

Finally, the observed demographic differences underscore the value of tailored educational approaches. Incorporating scenario-based learning, guided reflection, and culturally sensitive communication training may help address diverse developmental needs among medical students[43–44].

5. Limitations and future directions

Several limitations should be acknowledged. The sample was drawn from a single medical university, which may limit generalizability. Although the study employed a two-wave design, future research using fully longitudinal modeling techniques could provide deeper insight into individual developmental trajectories. Additionally, qualitative or intervention-based studies may further elucidate how emotional intelligence training translates into sustained empathic practice.

Despite these limitations, this study provides robust evidence that emotional intelligence plays a central role in empathy development among medical students and offers actionable insights for advancing humanistic medical education.

Declarations

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Author contributions

Conceived and designed the research: Z-q J, T-t Z. Wrote the paper: Z-q J. Analyzed the data: Z-q J, T-t Z. Revised the paper: Z-q J, T-t Z,All authors reviewed the manuscript.

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Data availability

The datasets generated and/or analyzed during the current study are not publicly available due privacy protection and ethical obligations but are available (in deidentified form) from the corresponding author on reasonable request.

Human Ethics and Consent to Participate declarations

This study adhered to the Declaration of Helsinki.Approved by the Ethics Committee of Southwest Medical University,No.SWMUIRBTX-202412-0040;Considering the privacy and security of the respondents, the questionnaires were filled out anonymously. The respondents were informed of the privacy, confidentiality and voluntary participation consent before filling out the questionnaires. The questionnaire was filled after obtaining informed consent from all participants of the study.All data were used for academic purposes only.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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