The impact of medical students' interpersonal relationships on their mental health: An analysis of the mediating effect of psychological capital

CeXin Dong, Yating Wei, Jinfa Zhao

Abstract:

BACKGROUND: Medical students' academic studies, clinical practice, and career preparation expose them to specific pressures that significantly affect their mental well-being. Effective interpersonal relationships contribute to reducing these demands, and psychological capital is crucial in facilitating this process. It is crucial to investigate the interplay between interpersonal interactions and psychological capital to have a more profound comprehension of the psychological dynamics that impact the mental health of medical students.

MATERIALS AND METHODS: Five hundred questionnaires, including the Positive Psychological Capital Questionnaire (PPQ), Comprehensive Diagnostic Scale for Human Relationships (CDHR), and Symptom Self-Criticism Scale (SCL-90), were delivered at a medical university in May 2024 for this study.

RESULTS: The interpersonal relationships among medical students varied significantly depending on their involvement in social service activities (t = 2.83**, $P < 0.01$). Further investigation revealed notable variations in the psychological capital levels of medical students based on gender, involvement in student leadership, and participation in social services (t = 2.12*, $P < 0.05$; t = 2.19*, $P < 0.05$; t = 3.45***, $P < 0.01$). The link between interpersonal interactions, psychological capital, and mental health was statistically significant (-0.0495**; 0.502**; -0.452**, $P < 0.01$).

CONCLUSION: The relationship status of medical students exhibited a statistically significant variation based on their involvement in social service activities (t = 2.83**, $P < 0.01$). Additional investigation revealed notable variations in the psychological capital levels of medical students based on gender, engagement in student leadership, and involvement in social service (t = 2.12*, $P < 0.05$; t = 2.19*, $P < 0.05$; t = 3.45***, $P < 0.01$). The link between interpersonal interactions, psychological capital, and mental health was statistically significant (-0.0495**; 0.502**; -0.452**, $P < 0.01$).

Keywords:

Adaptation, interpersonal relations, medical, mental health, psychological, psychological capital, students

School of Mental Health and Psychological Sciences, Anhui Medical University, No. 81 Meishan Road, Shushan District, Hefei City, Anhui Province, China

Address for correspondence:
Assoc. Prof. Jinfa Zhao, School of Health Management Anhui Medical University, No. 81 Meishan Road, Shushan District, Hefei City, Anhui Province, China. E-mail: zhaojinfa11@163. com

Introduction

The psychological well-being of medical students is crucial for their academic achievements and future professional viability. Particular groups within the medical education background are more prone to encountering mental health difficulties when transitioning from theoretical study to clinical practice.[1,2]

Difficulties in interpersonal relationships significantly contribute to psychological

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distress, characterized by unpleasant feelings such as frustration, low mood, and sadness resulting from the inability to fulfill social expectations.[3,4] Multiple studies have demonstrated a strong correlation between college students' mental well-being and their interpersonal social standing.[5] Empirical data indicate that favorable interpersonal relationships have a substantial beneficial impact on enhancing the mental well-being of medical students and can successfully decrease the likelihood of psychological suffering.[6,7]

Psychological capital, defined as a fundamental component of positive psychology, has a substantial beneficial impact on an individual's mental well-being. This notion comprises four dimensions: hope, resilience, optimism, and self-efficacy, which collectively represent the favorable psychological condition of individuals throughout their periods of growth and development.[8] Because of the specialized nature of their career, medical students are more prone to experiencing unpleasant emotions and hostile attitudes than other groups,[9] negatively impacting their mental well-being. Hence, a comprehensive examination of the impact of psychological capital on the mental well-being of medical students not only holds theoretical importance but also underscores its practical relevance.

This study aimed to investigate the connections among interpersonal interactions, psychological capital (including traits such as optimism, hope, self-efficacy, and resilience), and mental health among medical students. The specific goals of this study are to assess the present condition of interpersonal relationships, psychological capital, and mental health among medical students and to investigate any variations in these aspects based on demographic factors such as gender, engagement in student leadership, and involvement in social services. In addition, the study examines the mediating function of psychological capital in the relationship between interpersonal relationships and mental health. The present study posits the subsequent hypotheses: a positive correlation exists between good interpersonal connections and greater levels of psychological capital with improved mental health status and psychological capital acts as a mediator in the association between interpersonal relationships and mental health.

Currently, studies are deficient on the interplay among interpersonal skills, psychological capital, and mental health in medical students. The present study addresses the existing vacuum in information. It provides a comprehensive validation of the mediating function of psychological capital in the relationship between interpersonal relationships and mental health among a community of Chinese medical students.

This study develops and validates a novel theoretical model to explore the intricate interactive processes of interpersonal relationships, psychological capital, and mental health among medical students. The findings highlight the significant influence of psychological capital in reducing psychological stress and enhancing mental well-being among medical students. This analysis offers a fresh viewpoint for comprehending the intricacies of mental health among medical students. It enhances the current body of knowledge and establishes a fresh theoretical foundation for developing mental health intervention approaches in medical education. This has significant academic and practical significance. Furthermore, the findings of this study will be valuable for medical educators and policymakers globally. They can offer robust backing for enhancing the general mental well-being of medical students and designing their learning environments more effectively.

Materials and Methods

Study design and setting
This cross-sectional survey was performed at a medical university in May 2024. Five hundred questionnaires, comprising the Positive Psychological Capital Questionnaire (PPQ), Comprehensive Diagnostic Scale for Human Relationships (CDHR), and Symptom Self-Criticism Scale (SCL-90), were disseminated to evaluate psychological capital, interpersonal relationships, and mental health among medical students. The research investigated the impact of gender, student leadership engagement, and involvement in social services on these variables. Data collecting transpired in classroom environments and participation were optional.

Study participants and sampling
This study employed a random sample technique to distribute 500 questionnaires in a medical school in May 2024. Of these, 491 questionnaires were successfully collected, with 479 being valid and reaching a validity rate of 95.8%. The sample size was determined by regression analysis using G*Power software, considering the estimated effect size, standard significance level ($\alpha = 0.05$), and statistical validity (power = 0.80). According to this computation, the study would need a minimum of around 400 individuals to identify the primary effect successfully. Consequently, our sample size is enough for the investigation.

Data collection tool and technique
The present study used the Positive Psychological Capital Questionnaire (PPQ) as a revised instrument developed by Zhang.[10] This measurement scale comprises 26 evaluation items that specifically target four dimensions: self-efficacy, hope, resilience, and optimism. During the

assessment, participants were instructed to rate each item using the Likert 7-point scale, where 1 represented "completely disagree" and 7 represented "completely agree." The outcome scores varied from 26 to 182, with higher scores indicating greater individual positive psychological capital levels. Higher scores correspond to greater levels of positive psychological capital. Notably, items 8, 10, 12, 14, and 25 underwent reversal scoring. The PPQ showed a strong level of reliability and validity in this study, as evidenced by a Cronbach's alpha coefficient of 0.918 and a Kaiser–Meyer–Olkin (KMO) value of 0.925. These results indicate that the scale has a robust internal consistency and appropriate structural characteristics for practical factor analysis.

This study aimed to measure an individual's interpersonal distress on four dimensions: conversational distress, sociability and friendship distress, distress in dealing with others, and distress in interacting with the opposite sex, using the Comprehensive Interpersonal Relationship Diagnostic Scale developed by Zheng R.[11] The measurement scale comprises 28 assessment items that adhere to a binary scoring system (1 point for events that align with the question description and 0 points for situations that do not). The scores correspond to the level of interpersonal discomfort experienced by an individual. The Comprehensive Interpersonal Relationship Diagnostic Scale exhibited strong reliability and validity measures in the present investigation, notably a Cronbach's alpha coefficient of 0.906 and a KMO value of 0.921. These results validate the scale's exceptional consistency and overall fit performance.

The assessment used the Symptom Self-Control Scale (SCL-90), a tool comprising 90 items broken down into 10 categories: somatization, obsessive compulsive symptoms, interpersonal sensitivity, depression, anxiety, hostility, terror, paranoia, psychoticism, and miscellaneous items. For each evaluation, a 5-point rating system was employed. The present investigation obtained a Cronbach's alpha coefficient of 0.986 and a KMO value of 0.970 for the Symptom Self-Rating Scale, establishing its strong reliability and validity. The version employed was the same as the one modified by Wang Zhengyu in 1984.[12]

The data analysis was performed using the SPSS 26 software. The distributional properties of the metric variables were reported as the arithmetic mean plus average variance minus standard deviation *(M ± SD)*. Comparisons between metric variables were evaluated using a *t*-test or one-way ANOVA, and comparisons between categorical variables were conducted using Chi-square test or Fisher's exact test. The Pearson correlation coefficient was used to investigate the

association among psychological capital, interpersonal interactions, and mental health. To get a more comprehensive picture of the existence and magnitude of mediating effects, the researcher employed stepwise regression analysis with a bias-corrected percentile bootstrap approach to generate confidence intervals and conduct significant statistical tests. The statistical conclusions were made using the standard two-tailed test approach, with a significance threshold of $P < 0.05$.

Ethical consideration

The Anhui Medical University Ethics Committee accepted this investigation, with ethical assessment number 84230092. All participants were apprised of the study's purpose and were granted voluntarily informed consent. Confidentiality and anonymity were maintained throughout the research process.

Results

Comparative analysis of variations in demographic informatics about psychological capital, relationships, and mental health

This study used independent samples t-tests to investigate the variability of psychological capital, interpersonal relationships, and mental health across several dimensions such as gender, place of origin, being an only child, being a student cadre, and engaging in social services. Table 1 presents comprehensive demographic background data that serves as the foundation for a thorough examination of medical students' interpersonal interactions, psychological capital, and mental health status. Table 2 highlights the precise performance of medical students in various aspects of interpersonal relationships, psychological capital, and mental health. This data set will be valuable for future research to investigate the interrelationships among these variables and their influence on mental health.

Table 3 presents the comparative analysis *(M ± SD)* of the indicators among the study participants, considering

Table 1: Descriptive statistics of demographic indicators (*n*=479)

Variable	Category	Count *n* (%)
Gender	Male	198 (41.34)
	Female	281 (58.66)
Place of origin	Rural	284 (59.29)
	Urban	195 (40.71)
Only child or not	No	359 (74.95)
	Yes	120 (25.05)
Class cadre or not	No	141 (29.44)
	Yes	318 (66.39)
Whether serving as a class cadre	No	52 (10.86)
	Yes	407 (84.97)

various demographic characteristics. More precisely, as indicated below, analysis of the interpersonal relations scale revealed a statistically significant difference *(t = -2.83**, P < 0.01)* between students who had engaged in social services and those who had not. Specifically, students who participated in social services showed a notable advantage at the interpersonal relations level compared with those who did not. At the psychological capital level, gender *(t = 2.12*, P < 0.05)*, experience as student leaders *(t = -2.19*, P < 0.05)*, and involvement in social services *(t = -3.45***, P < 0.001)* exhibited

statistically significant differences. The placement of birth did not show any notable disparities. However, subsequent examination indicated that students who held positions as student leaders and engaged in social services exhibited notably greater levels of psychological capital than those who did not hold such positions and did not participate in social services. However, the statistical significance of the differences between the categorical factors at the mental health level was not achieved *(P > 0.05)*.

The study above indicates that engagement in social service activities and the involvement of student leaders benefit the development of students' psychological capital and the enhancement of interpersonal relationships. In addition, the gender factor has a distinct influence on the structure of psychological capital. However, It should be noted that no substantial difference was found between these variables in the mental health assessment.

An investigation of the correlation among interpersonal interactions, psychological capital, and mental health among medical students

A correlation analysis of interpersonal interactions, psychological capital (including optimism, hope, self-efficacy, and resilience), and mental health status is shown in Table 4. As can be seen from the table, the correlations of all three reached the level of significance *(P < 0.01)* and specific analyses revealed that there was a significant negative correlation between interpersonal relationships and psychological capital, with a correlation coefficient of *(r = -0.0495, P < 0.01)*; there was a significant positive correlation between interpersonal relationships and psychological health, with a correlation coefficient of *(r = 0.502, P < 0.01)*; there was a significant negative correlation between psychological capital; and there is a significant negative

Table 2: Descriptive statistics of interpersonal relationships, psychological capital, mental health total scores, and dimensions

Scale dimensions	*n*	Mean±SD
Psychological Capital - Total Score	479	115.80±20.27
Psychological Capital - Optimism	479	28.15±6.17
Psychological Capital - Hope	479	28.56±5.87
Psychological Capital - Self-efficacy	479	29.93±6.05
Psychological Capital - Resilience	479	29.15±6.13
Interpersonal Communication - Total Score	479	10.79±6.66
Interpersonal Communication - Conversation	479	2.79±2.05
Interpersonal Communication - Socializing	479	3.63±2.22
Interpersonal Communication - Interacting with Others	479	1.87±1.72
Interpersonal Communication - Interaction with the Opposite Sex	479	2.50±1.86
SCL-90 Total Score	479	137.53±51.75
SCL-90 Total Score	479	16.61±6.79
SCL-90 Obsession	479	18.20±7.14
SCL-90 Interpersonal Sensitivity	479	14.61±6.09
SCL-90 Depression	479	20.90±8.64
SCL-90 Anxiety	479	14.94±6.10
SCL-90 Anxiety	479	8.64±3.72
SCL-90 Phobia	479	10.09±4.29
SCL-90 Paranoia	479	8.74±3.57
SCL-90 Psychoticism	479	14.59±5.95
SCL-90 Others	479	10.23±4.23

Table 3: Analysis of differences in research variables across demographic variables (M±SD)

Variable	Category	Interpersonal relationships	Psychological capital	Mental health
Gender	Male	67.85±10.08	118.13±19.67	142.95±55.95
	Female	67.67±9.17	114.15±20.55	133.72±48.31
	t	0.2	2.12*	1.88
Place of origin	Rural	67.38±8.98	114.64±19.91	138.33±53.46
	Urban	68.28±10.32	117.48±20.71	136.37±49.26
	t	-1.01	-1.51	0.41
Only child or not	NO	67.64±9.69	115.45±20.32	136.80±50.50
	Yes	68.08±9.17	116.82±20.16	139.73±55.47
	t	-0.43	-0.64	-0.54
Class cadre or not	NO	66.88±9.27	113.53±18.92	140.67±56.58
	Yes	68.41±9.70	117.98±20.55	135.52±49.69
	t	-1.58	-2.19*	0.98
ccWhether serving as a class cadre	NO	64.42±8.34	107.65±18.46	149.02±56.91
	Yes	68.39±9.65	117.76±20.09	135.58±51.10
	t	-2.83**	-3.45***	1.76

(*indicates *P*<0.05, ** indicates *P*<0.01, *** indicates *P*<0.001, same below) ccc cc. *t*: *t*-test, F: ANOVA

Table 4: Correlation analysis of variables

	1	2	3	4	5	6	7
1. Interpersonal relationships	-						
2. Psychological capital	-0.0495**	-					
Optimism	-0.370**	0.857**	-				
Hope	-0.358**	0.820**	0.670**	-			
Self-efficacy	-0.480**	0.862**	0.636**	0.598**	-		
Resilience	-0.447**	0.808**	0.556**	0.491**	0.649**	-	
3. Mental health	0.502**	-0.452**	-0.396**	-0.332**	-0.387**	-0.396**	-

**indicates the correlation is significant at the 0.01 level

correlation between mental health with a correlation coefficient of *(r = -0.452, P < 0.01)*.

A substantial negative association was observed between interpersonal interactions and optimism among the subdimensions of psychological capital, with a correlation coefficient of *(r = -0.370, P < 0.01)*. A substantial inverse association exists between interpersonal interactions and hope, as indicated by a correlation coefficient of *(r = -0.358, P < 0.01)*. A substantial inverse association exists between interpersonal interactions and self-efficacy, as indicated by a correlation value of *(r = -0.480, P < 0.01)*. The correlation coefficient between interpersonal interactions and resilience was calculated as –0.447, with a significance level of *P < 0.01*.

In the context of psychological capital and its subdimensions, a notable positive association exists between optimism and hope, as indicated by a correlation value of *(r = 0.670, P < 0.01)*. The correlation coefficient between optimism and self-efficacy is 0.636, with a statistically significant positive relationship *(P < 0.01)*. The correlation coefficient between optimism and resilience is 0.556, with a statistically significant positive relationship *(P < 0.01)*. The correlation coefficient between hope and self-efficacy is 0.598, with a statistically significant positive relationship *(P < 0.01)*. The correlation coefficient between hope and resilience is 0.491, with a statistically significant positive relationship *(P < 0.01)*. The correlation coefficient between self-efficacy and resilience is 0.649, with a statistically significant positive relationship *(P < 0.01)*.

An analysis of the association between psychological capital subdimensions and mental health revealed a strong negative correlation between optimism and mental health, with a correlation coefficient of –0.396 *(P < 0.01)*. The correlation coefficient between hope and mental health is –0.332, with a statistically significant negative relationship *(P < 0.01)*. A substantial inverse relationship exists between self-efficacy and mental health, as indicated by a correlation value of *(r = -0.387, P < 0.01)*. The correlation coefficient between resilience and mental health was statistically significant, with a negative correlation of *(r = -0.396, P < 0.01)*.

The evidence revealed above clearly indicates that interpersonal ties and psychological capital substantially impact the mental well-being of medical students. Superior interpersonal relationships correlate with increased psychological capital and improved mental well-being. A robust positive correlation exists among the sub-dimensions of psychological capital: optimism, hope, self-efficacy, and resilience. Furthermore, all these dimensions exhibit a noteworthy negative correlation with psychological health. This implies that the enhancement of psychological capital can improve medical students' mental health status.

An investigation of the role of psychological capital in mediating the relationship between interpersonal interactions and mental health

This study employed a theoretical model to investigate the mediating role of psychological capital in the relationship between interpersonal relationships and mental health. The model constructs interpersonal relationships as an independent variable, psychological capital as a mediator variable, and mental health as a dependent variable. A mediation effect study was conducted using the PROCESS model 4 in the SPSS macro program. The original data set *(N = 479)* was chosen as the Bootstrap sampling base, consisting of 5,000 samples, to estimate the 95% confidence interval of the mediation effect. By controlling for potential confounding factors such as gender, home status, being an only child, being a student leader, and engaging in social services, we have confirmed the significant significance of psychological capital in mediating the association between interpersonal interactions and mental health.

The direct impact of interpersonal interactions on mental health was statistically significant *(β = 3.785, P < 0.001)*. The model's explanatory ability was indicated by $R^2 = 0.264$ and *F = 23.135 (P < 0.001)*. Bootstrap analysis yielded a t-value of 11.858 with a 95% confidence range of [3.158, 4.412]. These findings indicate that a positive interpersonal relationship directly impacts the psychological well-being of medical students.

The influence of psychological capital in moderating the association between relationships and mental health was

statistically significant (β = *2.659, P < 0.001*). The regression analysis revealed that the model had an explanatory power of $R^2 = 0.329$ and F = *27.567 (P < 0.001)*. Statistical significance of the mediating effect was further established by bootstrap analysis with a 95% confidence interval of [1.972, 3.347] and a t-value of 7.602. The mediation effect of optimism was statistically significant *(β = 3.076, P < 0.001)* in the link between relationships and mental health. The model indicated an explanatory power of $R^2 = 0.32$, F = *26.517 (P < 0.001)*. The Bootstrap analysis yielded a 95% confidence interval of [2.431, 3.722] and a t-value of 9.368, suggesting a significant mediating influence. Hope acting as a mediator between relationships and mental health was also statistically significant (β = *3.3, P < 0.001)*. The model produced an explanatory power of $R^2 = 0.293$, F = *23.28 (P < 0.001)*. A bootstrap analysis with a 95% confidence interval of [2.644, 3.955] and a t-value of 9.896 confirmed the presence of a significant mediating effect. The mediation effect of self-efficacy between psychosocial relationships and mental health was statistically significant *(β = 3.007, P < 0.001)*. The model produced an explanatory power of $R^2 = 0.299$ and F = *23.935 (P < 0.001)*. A bootstrap analysis with a 95% confidence interval of [2.312, 3.701] and a t-value of 8.508 revealed that the mediating effect is statistically significant. The mediating effect of resilience of relationships and mental health was statistically significant (β = *2.89, P < 0.001)*. The model's explanatory strength was $R^2 = 0.312$ and F = *25.447 (test statistic P < 0.001)*. The bootstrap analysis, with a 95% confidence interval of [2.205, 3.575] and a t-value of 8.292, has shown the statistical significance of the mediation effect. Detailed information can be found in Table 5.

To summarize, psychological capital and its subdimensions (optimism, hope, self-efficacy, and resilience) were prominent mediators in the link between interpersonal interactions and psychological well-being. This implies that establishing positive interpersonal interactions might not only immediately enhance the mental well-being of medical students but also contribute to mental health promotion by augmenting psychological capital and its various aspects. Specifically, hope and optimism had a notable impact on mental well-being, indicating that these specific dimensions of psychological capital should be prioritized in developing psychological intervention approaches. The findings of this study offer significant theoretical backing for the promotion of mental health and provide precise guidance for the creation of interventions.

The study's findings shown in Table 6 indicate that both direct and indirect mechanisms mediate the impact of interpersonal connections on the mental well-being of medical students. The direct impact of interpersonal interactions on mental health was substantial, with an effect value of 3.785. This effect was further amplified by psychological capital and its subdimensions: optimism, hope, self-efficacy, and resilience. Precisely, the variables of optimism (effect value of 3.076), hope (effect value of 3.299), self-efficacy (effect value of 3.007), and resilience (effect value of 2.89) exhibited a significant direct impact, indicating that these aspects of psychological capital are crucial in achieving mental health promotion. Furthermore, the data depicting the total mediating effects in the table demonstrate the significant influence of psychological capital (effect value of 1.126), optimism (effect value of 0.709), hope (effect value of 0.796), and self-efficacy (effect value of 0.895) on psychological well-being through indirect channels. Figure 1 illustrates the mediation effect model among the three variables. These findings indicate that interpersonal connections have a direct impact on mental health and also indirectly contribute to mental health by improving psychological capital and its components. Hope and self-efficacy emerged as the most influential factors in the mediated route, indicating that treatments aimed at these aspects of psychological capital could successfully enhance the mental well-being of medical students.

Discussion

This study found 123 persons with a total SCL-90 score above the threshold value of 160, resulting in a positive detection rate of 25.68% for mental health issues. Among the specific mental health indicators, depression obtained the highest score of 20.90 ± 8.64, closely followed by obsessive compulsive symptoms with a score of 18.20 ± 7.14, consistent with the results of other research.[13] Nevertheless, the positive detection rate in this investigation was comparatively lower than that of Chen Lihua *et al*.[14] and Bai Yuanyuan *et al*.[15] However, it was more significant than the rates reported by Zhao Hui *et al*.[16] and Fan Shenggen *et al*.[17] This study demonstrates that while there are indications of progress in the mental well-being of medical students, there remains a necessity for ongoing focus and improved interventions to enhance the overall condition.
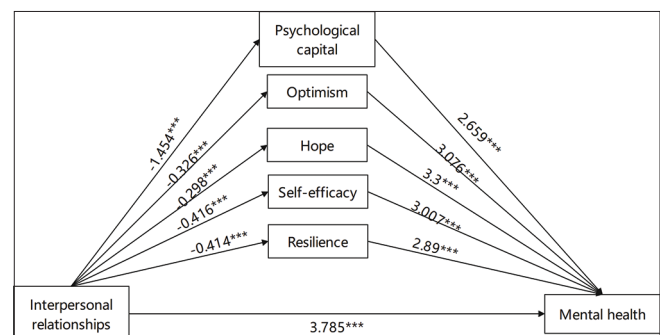

Figure 1: Mediation effect model of interpersonal relationships, psychological capital, and mental health. Based on the Social Support Theory and Psychological Capital Theory

Table 5: Mediation effect analysis of psychological capital on the relationship between interpersonal relationships and mental health

Regression equation		Overall fit index			Significance of regression coefficients			
Outcome variable	Predictor variable	R	R^2	F	β	Bootstrap Lower Limit	Bootstrap Upper Limit	t
Psychological capital	Interpersonal relationships	0.533	0.284	25.517***	-1.454	-1.695	-1.214	-11.897***
Optimism		0.387	0.15	11.337***	-0.326	-0.406	-0.247	-8.037***
Hope		0.397	0.158	12.062***	-0.298	-0.374	-0.222	-7.729***
Self-efficacy		0.526	0.276	24.616***	-0.416	-0.489	-0.344	-11.295***
Resilience		0.508	0.258	22.401***	-0.414	-0.487	-0.34	-11.063***
Mental health	Interpersonal relationships	0.514	0.264	23.135***	3.785	3.158	4.412	11.858***
Mental health	Interpersonal relationships Psychological capital	0.574	0.329	27.567***	2.659	1.972	3.347	7.602***
	Interpersonal relationships Optimism	0.566	0.32	26.517***	3.076	2.431	3.722	9.368***
	Interpersonal relationships Hope	0.541	0.293	23.28***	3.3	2.644	3.955	9.896***
	Interpersonal relationships Self-efficacy	0.546	0.299	23.935***	3.007	2.312	3.701	8.508***
	Interpersonal relationships Resilience	0.558	0.312	25.447***	2.89	2.205	3.575	8.292***

The above results were obtained after controlling for confounding factors (gender, household registration, only child status, class cadre status, and participation in social services)

Table 6: Mediation effects of psychological capital and its dimensions on the relationship between interpersonal relationships and mental health

Item	Effect size	Effect size	SE	Proportion of effect	95%CI	
					Upper limit	Lower limit
Total effect		3.785	0.319	100%	3.158	4.412
Direct effect	Psychological capital	2.659	0.35	70.25%	1.972	3.347
	Optimism	3.076	0.328	81.27%	2.431	3.722
	Hope	3.299	0.333	87.16%	2.644	3.955
	Self-efficacy	3.007	0.353	79.45%	2.312	3.701
	Resilience	2.89	0.349	76.35%	2.205	3.575
Total mediation effect	Psychological capital	1.126	0.213	29.75%	0.716	1.561
	Optimism	0.709	0.161	18.73%	0.409	1.042
	Hope	0.486	0.139	12.84%	0.234	0.78
	Self-efficacy	0.778	0.188	20.55%	0.408	1.147
	Resilience	0.895	0.189	23.65%	0.54	1.283

A lower threshold for psychological capital was established by subtracting the standard deviation from the mean. Although medical students exhibit a somewhat high degree of psychological capital, specific individuals still possess less of this attribute. Prior research has demonstrated a robust correlation between psychological capital and mental well-being, underscoring its significance for the capacity of college students to manage life and academic difficulties effectively.[18] Empirical research conducted in China also corroborates this perspective.[19] Contrary to Chen Manli's study,[20] differential analysis for location of origin did not reveal significant changes in this study. Regarding gender comparison, male students' overall psychological capital scores were notably more significant than female students, which aligns with Chen Manli's research findings. Furthermore, this study revealed that medical students who engaged in

student cadre work or social service activities exhibited notable disparities in the evaluation of psychological capital compared with those who did not undertake such responsibilities. This conclusion aligns with the discovery made by Jingying Xu,[21] which indicated that medical students who held positions as student leaders had notably better scores on the "hope" component compared to those who did not serve in this capacity. The present discovery provides more evidence favoring the proposition that psychological capital safeguards mental well-being. A substantial negative association was seen between psychological capital and mental health. The study conducted by revealed a negative correlation between psychological capital and its associated characteristics (optimism, hope, self-efficacy, and resilience) with mental health status.[22] This finding provides further evidence supporting the notion that psychological capital has a beneficial impact on mental

health. High self-efficacy and resilience persons had greater resilience to mental health issues, aligning with comparable results in international research. These findings indicate that improving psychological capital, particularly self-efficacy and resilience, is a successful approach to developing psychological intervention therapies.

Within the evaluation of interpersonal relationships, a cumulative score above 9 signifies the existence of interpersonal difficulties, a particular factor score above 3 suggests distress in a particular area, and when the overall score exceeds 14, it signifies that interpersonal distress has reached a severe level. This study found that medical students experience a certain degree of distress in interpersonal relationships, particularly in the area of communication. Previous research has indicated that medical students exhibit greater interpersonal sensitivity than regular college students.[23] Furthermore, among medical specialty college students, interpersonal relationship discomfort is notably higher than among other comprehensive college students. The current research findings have verified that the overall detection rate of interpersonal relationship distress among medical students was notably more than that of prior studies on medical students, which reported a rate of 47.8%.[24] Furthermore, it suggests that interpersonal connection issues in medical education require further focus and assistance. To investigate the interplay of these variables, it is crucial to analyze the links among interpersonal interactions, psychological capital, and mental health in medical students.

The investigation of the connection between interpersonal interactions and psychological capital among medical students yielded a statistically significant negative correlation. Despite the modest magnitude of the correlation coefficient, this discovery indicates that the augmentation of psychological capital is inversely linked to the decrease of interpersonal stress among medical students. The present discovery is consistent with Jingying Xu's work.[21] Moreover, Finch's research provided additional evidence that interpersonal relationships can predict the development of psychological capital in teenagers.[25] Furthermore, there were notable inverse associations between interpersonal interactions and many dimensions of psychological capital. Significantly, the strongest negative association was observed between self-efficacy and interpersonal interactions. These findings align with the results reported by Jia-Li Fu and her colleagues.[26] The research demonstrated that students with elevated optimism, anticipation, self-efficacy, and resilience experienced comparatively less harmful emotional strain when managing interpersonal relationships.

Furthermore, the correlation analysis from this study demonstrated a statistically significant positive association between interpersonal interactions and mental health. These findings indicate that the decline in mental health conditions is closely correlated with the escalation of interpersonal difficulties experienced by medical students. Prior research has also highlighted the striking disparity between the mental health condition of medical students and their patterns of interpersonal interaction.[27] Subsequent investigation revealed that the group experiencing extreme interpersonal distress had notably higher overall SCL-90 scores compared with those who were usually distressed. Furthermore, the generally troubled group displayed higher scores than those who showed exceptional ability in managing interpersonal interactions. These results emphasize the substantial influence of many interpersonal relationships on an individual's psychological well-being, especially the robust correlation between the acquisition of interpersonal skills and psychological well-being.[28] Specifically, persons who possess robust interpersonal abilities generally have elevated levels of mental well-being, as opposed to those who encounter significant interpersonal difficulties and consequently experience diminished levels of mental health. Therefore, it is recommended that mental health treatments incorporate techniques aimed at enhancing interpersonal interactions. Peng and Wei (2020) proposed that adopting interpersonal and psychological training has successfully enhanced college students' mental well-being. Such interventions help students manage interpersonal difficulties, such as social anxiety and avoidance.[29] Given this, prioritizing cultivating their interpersonal abilities is crucial in improving medical students' mental well-being. To achieve this objective, schools can consistently conduct activities and establish communication platforms to improve students' communication abilities. Simultaneously, engagement in psychological group activities can not only augment students' empathy and comprehension but also efficiently boost interpersonal relationships, so fostering the advancement of mental well-being.

On investigating the association between psychological capital and mental health, this study found a statistically significant negative correlation between the total mental health score and the total psychological capital score, optimism, hope, self-efficacy, and resilience. The findings suggest a strong and positive correlation between higher levels of psychological capital and its component aspects with improved mental health. More precisely, those who possess greater resilience are capable of successfully managing unpleasant feelings and thoughts of suicide by maintaining optimistic views about life and seeking assistance from others when faced with difficulties.[30] This discovery aligns with the current body of research.

It provides more evidence of the substantial positive correlation between aspects of psychological capital and the mental well-being of college students.[31] Hence, these findings indicate that augmenting psychological capital could be a potent strategy to enhance the mental well-being of medical students.

This study's findings indicate that medical students' mental health conditions can be significantly improved by optimizing psychological capital, particularly in developing self-efficacy and resilience. Consequently, higher education institutions and mental health service providers must prioritize the development of psychological capital, particularly by enhancing self-efficacy and resilience. This will effectively enhance the general mental health and well-being of medical students. Subsequently, it may be worthwhile to investigate group psychological therapies and counseling services to bolster medical students' psychological capital and foster more profound interpersonal relationships, eventually promoting the improvement of their mental well-being. Moreover, an examination of the correlations between interpersonal contacts and psychological capital, supplemented by regression models, can yield a more nuanced understanding of the mediating function of psychological capital in the interplay between these factors and mental health.

This study validates a substantial favorable association between interpersonal interactions and mental well-being. To further investigate the fundamental processes associated with the two, we incorporated psychological capital as a mediating variable and examined it using regression analysis techniques. Our specific objective was to investigate the mediation function of psychological capital in the relationship between interpersonal relationships and mental health. The results established that psychological capital substantially mediated the association between interpersonal interactions and mental health. More precisely, the impact of interpersonal relationships on mental health was achieved mainly by the intermediary mechanism of psychological capital. Further investigations indicated that over 33% of the impact of interpersonal interactions on mental health was indirectly manifested through psychological capital. Furthermore, a thorough analysis was conducted on the impact of various aspects of psychological capital in mediating the results. The findings demonstrate that self-efficacy and resilience have a notably important function in the mediating effect, underscoring their indispensable importance in elucidating the impact of relationships on mental health through these aspects. This discovery corroborates our initial study concept.

This result underscores the need to prioritize methods to improve psychological capital in mental health treatments, namely to reduce the negative impact of relationship difficulties on mental well-being by bolstering self-confidence and the ability to recover from setbacks. Consistent with our original hypothesis, psychological capital directly influences mental health and indirectly moderates the influence of interpersonal interactions. Although these findings offer significant theoretical insights, it is essential to acknowledge the study's limits and possible avenues for further research.

This study generated significant findings investigating the connections between interpersonal interactions, psychological capital and its components, and mental health among medical students. This study thoroughly validated the mediating function of psychological capital in a cohort of Chinese medical students. This innovative approach offers valuable insights into the dynamics of mental health among medical students and addresses a knowledge gap in related domains. Furthermore, the results offer theoretical grounding for developing medical education and mental health intervention approaches to augment self-efficacy and resilience to enhance mental well-being. These findings are significant points of reference for educators and policymakers worldwide. Finally, this work employed a range of statistical methods, such as stepwise regression and Bootstrap approaches, to guarantee the dependability and statistical significance of the results, thus strengthening the trustworthiness of the conclusions.

However, the study does have many inherent limits and flaws: The sample was restricted to a medical university in Anhui Province, which could include regional and professional biases that restrict the generalizability of the results; The cross-sectional methodology of the study is limited to identifying correlations and cannot demonstrate causality. Therefore, future research should use a longitudinal strategy to monitor and analyze the dynamic changes among variables; Even after accounting for certain demographic factors, other possible confounding factors (such as social support and personality traits) may have affected the findings. Therefore, future research should explore additional variables to comprehensively grasp the intricate connections among relationships, psychological capital, and mental health. Notwithstanding these constraints, the study's results offer substantial empirical evidence and establish a robust basis for deriving major conclusions on the influence of psychological capital and interpersonal relationships on the mental health of medical students.

This study aims to establish a solid empirical foundation to thoroughly investigate the relationship between interpersonal interactions, psychological capital, and

mental health among medical students. The empirical findings demonstrate the crucial significance of psychological capital in mitigating interpersonal stress and enhancing psychological well-being. Improving two specific aspects of psychological capital, self-efficacy, and resilience, had a notable impact on mental well-being among medical students. Considering this discovery, it is recommended that institutions of higher education and mental health services prioritize the cultivation of psychological capital and implement specific psychological intervention methods to facilitate the mental health growth of medical students adequately.

This study found that psychological capital, especially self-efficacy and resilience, was vital in mediating interpersonal relationships and mental health among medical students. Based on the goal of strengthening mental health services proposed in China's "Healthy China 2030" planning program, it is recommended that psychological capital development be incorporated into the medical education system, with a focus on improving medical students' psychological resilience and self-efficacy. This will not only help to reduce their psychological stress but also cultivate more psychologically healthy professionals for China's healthcare industry, thereby promoting the implementation of national health policies and the sustainable development of the healthcare industry.

Acknowledgement

Ethics statement
Under ethical evaluation number 84230092, the Ethics Committee of Anhui Medical University approved this study enterprise.

Policy brief
Strategies to enhance medical students' psychological capital.

Background

Academic and clinical stressors faced by medical students have severe implications for their mental health. Studies have shown that enhancing psychological capital, including self-efficacy and resilience, can help alleviate these stresses and improve mental health. Policy interventions are essential to ensure the mental health of future healthcare professionals.

Policy objectives
To enhance the psychological capital of medical students and improve their mental health through policy interventions to support the implementation of the "Healthy China 2030" Plan and the National Mental Health Work Plan.

Suggested Measures
Psychological capital training: Introduce a psychological capital curriculum in medical education, focusing on developing self-efficacy and resilience.

Supporting student participation: Encourage participation in student leadership and social services to enhance mental resilience.

Strengthening psychological support: Improving mental health services in higher education and providing personalized psychological counselling.

Expected effects
These measures will significantly enhance the psychological capital of medical students, improve mental health, cultivate healthier medical professionals, and help implement national health policies.

Ethics statements
This study was approved by the Ethics Committee at Anhui Medical University (protocol number: 84230092). Partici-pants completed an informed consent form, and they were told that if they felt any discomfort while answering questions, they could opt out of the survey at any time without being punished.

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Conflicts of interest
There are no conflicts of interest.

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