

# Psychological Capital and Its Factors as Mediators Between Interpersonal Sensitivity and Depressive Symptoms Among Chinese Undergraduates

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**Purpose:** Current interpersonal sensitivity among college students is easily linked to mood disorders such as anxiety, depression and other mood disorders. This study aims to examine the mediating role of psychological capital and its dimensions in the relationship between interpersonal sensitivity and depressive symptoms among undergraduates.

**Methods:** The cross-sectional survey was conducted by using cluster stratified random sampling method across six Chinese universities between November and December 2022. The questionnaire consists of the Interpersonal Sensitivity sub-scale, the Patient Health Questionnaire, the Psychological Capital Questionnaire and the Socio-Demographic Feature Questionnaire.

**Results:** A total of 2580 respondents participated in the survey, with the majority being females (69.73%) and an average age of 19.22 ± 1.28 years. Descriptive and correlation analyses were performed using SPSS v24.0, while direct and indirect effects were analyzed using PROCESS v3.4 macro. The findings revealed that interpersonal sensitivity had a significant direct effect on depression symptoms among undergraduates ( $\beta = 0.416$ , 95% Boot CI [0.380, 0.453],  $p < 0.001$ ). Additionally, psychological capital and its components were found to be negatively correlated with depression ( $p < 0.001$ ). Further analysis demonstrated that hope, optimism, and resilience significantly mediated the association between interpersonal sensitivity and depressive symptoms (indirect effect: hope = 0.056, optimism = 0.074, resilience = 0.099;  $p < 0.001$  for all).

**Conclusion:** These results suggest that psychological capital, including its dimensions of hope, optimism, and resilience plays a crucial role in mitigating the negative effects of interpersonal sensitivity on depressive symptoms among undergraduates.

**Keywords:** depressive symptoms, interpersonal sensitivity, psychological capital, Chinese undergraduates, multiple mediation

## Introduction

The depression of college students is dynamic, which makes it difficult to identify depression clinically when symptoms first appear.<sup>1</sup> There are many causes of depression, and for college students, who are in a period of rapid psychology development, a variety of factors may contribute to the emergence of depression in college students. Genetic factors, internal factors such as self-harm, or external factors such as exam pressure, job hunting and internships can all be sources of depression. In addition, a follow-up survey from college students in China shows that the developmental multiple trajectories of depression, anxiety and stress is common among college students.<sup>2</sup> The impact of depression on college students cannot be underestimated. Depression can lead to symptoms such as anxiety and insomnia in college students.<sup>3,4</sup> Research has shown that depressed mood can lead to bad habits such as smartphone addiction, and even substance abuse among college students,<sup>5,6</sup> which can hinder the healthy growth of college students, bring physical and mental health burden, and even lead to commit crimes and suicidal ideation.<sup>7</sup>

At the moment, we are in a post-pandemic era. The World Health Organization<sup>8</sup> reports that COVID-19 has led to a 25% increase in depression and anxiety globally. Young people, in particular, have been hit hardest by their mental health, and 90% of countries have included depression in their COVID-19 strategies. In China, as in most countries, depression has captured the nation's attention. According to the 2022 National Blue Book of Depression, 77% and 69% of student patients in China are prone to depression in interpersonal and family relationships.<sup>9</sup> An analysis of SCL-90 data from college students in Hubei Province showed that interpersonal sensitivity and depression ranked in the top three.<sup>10</sup> During the COVID-19, depression affected by interpersonal relationships become more elevated and arouse the attention of researchers.<sup>11–13</sup>

Interpersonal sensitivity is a widely studied interpersonal relationship variable and an important issue among college students. Interpersonal sensitivity refers to the tendency to be alert and sensitive to the evaluation of others and to avoid negative social evaluation by adopting defensive behaviors (such as obedience or inhibition) as an integrated personality characteristic of individuals.<sup>14</sup> Interpersonal sensitivity often affects the feelings during social interactions, which is generally manifested as inner vulnerability in the presence of others, as well as expectations or fantasies about criticism and rejection.<sup>15</sup> Interpersonal sensitivity can indeed affect social skills to a certain extent, as it can influence individuals' perceptions of society and attitudes towards life. Previous studies have found that interpersonal sensitivity is also associated with some early symptoms of psychosis.<sup>16</sup> During the COVID-19, the overall level of depression of college students with higher interpersonal sensitivity was higher than that of college students with lower interpersonal sensitivity, regardless of whether they were in the urban blockade environment.<sup>13</sup> Interpersonal sensitivity is positively correlated with depressive mood.<sup>12</sup> In the process of interpersonal communication, individuals with high interpersonal sensitivity are relatively more sensitive and prone to negative emotions, and depressive mood is relatively more likely to occur. The above research provides strong evidence for the influence of interpersonal sensitivity on depressive mood. Therefore, this study proposes hypothesis 1 (H1):

Interpersonal sensitivity has a significant positive impact on depressive mood.

Psychological capital (PsyCap) is a relatively large concept, with four dimensions (self-efficacy, hope, optimism, and resilience), and it is relatively easy to measure and quantify.<sup>17</sup> PsyCap refers to a state of positive psychological development that an individual shows in the process of growth and development.<sup>18</sup> PsyCap is believed to enhance college students' acceptance of college, enable them to better control their emotions, and reduce bad habits such as internet addiction.<sup>19</sup> PsyCap can alleviate the influence of depression caused by ostracism help economically disadvantaged youths set up better life goals.<sup>20</sup> In our previous research, we also found that PsyCap can mediate the relationship between interpersonal sensitivity and depression among postgraduate students in China.<sup>11</sup> However, previous research on undergraduate students only discussed the relationship between interpersonal sensitivity and psychological capital with freshmen<sup>21</sup> and one university<sup>12</sup> as moderating variables. However, previous studies on the relationship between interpersonal sensitivity, depressive symptoms and PsyCap also included other confounding variables, and the sample representation was insufficient. This study will focus on the mediating role of PsyCap between interpersonal sensitivity and depressive symptoms through expanding samples data. Therefore, hypothesis 2 (H2) is proposed:

PsyCap plays a mediating role in the pathway of interpersonal sensitivity leading to depression.

Self-efficacy refers to having the confidence and ability to make the necessary efforts to succeed in the face of challenging work. Higher self-efficacy generally means more being efficient and more capable of working to their full potential. Previous studies have shown a significant negative correlation between self-efficacy beliefs and interpersonal sensitivity among parents involved in parent-child violence.<sup>22</sup> Low self-efficacy and low ability to solve interpersonal problems are among the risk factors for the development of depression.<sup>23</sup> The results of a longitudinal data from four years of Chinese college students also show that the level of general self-efficacy plays a very important role in the probability of depression.<sup>24</sup> In addition to depressive mood, high self-efficacy is negatively correlated with neuroticism and positively correlated with extraversion, playing an important role in the prevention and treatment of many

psychological problems.<sup>25</sup> Hope refers to perseverance in working towards a goal and adjusting the path to achieve it if necessary. Studies have shown that improving nurses' interpersonal skills can help to raise their level of hope.<sup>26</sup> The study indicated that hopeful left-behind children reported fewer depressive symptoms,<sup>27</sup> while the hope of depressed patients is relatively low, and it is easy to induce suicidal behavior.<sup>28</sup> A meta-analysis also showed that despair and depression are risk factors for suicidal behavior.<sup>29</sup> Optimism refers to having a positive attitude towards current and future success. In a study of poor college students in China, optimism was significantly negatively correlated with interpersonal sensitivity.<sup>30</sup> Optimism was negatively correlated with depression in adolescents,<sup>31</sup> in the youth and middle age of life, natural optimists can benefit more from mental health in relative terms.<sup>32</sup> Resilience is the ability to persevere in the face of adversity and problems, to recover quickly, and to rise above obstacles. Resilience as a mediator has been studied by previous researchers. Another study on college students during the blockade of the COVID-19 epidemic has confirmed that resilience can play a partial mediating role between interpersonal sensitivity and depression.<sup>13</sup> A research of college students in eastern China found that resilience and depression are significantly positively correlated.<sup>33</sup> We find that the field of studying the four components of PsyCap separately remains a gap in the study of the relationship between interpersonal sensitivity and depression. Therefore, our study will further explore the mechanisms of self-efficacy, hope, optimism, and resilience in interpersonal sensitivity and depression. Based on the above research results, hypothesis 3 (H3) of this study:

The component dimension of PsyCap will also have a partial mediating effect on interpersonal sensitivity and depression.

In this study, we will focus on the mediating role of PsyCap and its four dimensions. Based on the considerations of the above issues, our research mainly explores the relationship between interpersonal sensitivity, PsyCap, and their four components (self-efficacy, hope, optimism, resilience) and depression. At the same time, we test the role and impact of PsyCap and its components in mediating the process of interpersonal sensitivity-induced depression.

## Methods

### Study Design and Sample

Cluster stratified sampling using a web-based method was used at six Chinese universities during November and December 2022. The objectives of this questionnaire collection were clarified by commissioning the relevant personnel from each school through contact and communication with the instructor research team. According to the principles of cluster sampling and stratified random sampling at each university, students from colleges and related grades are randomly selected and the data collection is completed within a certain period. Each university group was randomly selected from 1–2 colleges (no less than 500 participants), and the stratified sample consisted of 4 undergraduate students in different grades. A total of 3156 college students were included in this study, complete and effective responses were obtained from 2580 individuals (response rate: 81.75%). Exclusion criteria for data included: (1) the answer had an identical pattern, (2) the response had a short time, and (3) the attention test question was answered incorrectly.

### Measurements

#### Common Method Bias

A common method bias test is performed by performing a factor analysis on all terms of the scale used. The results showed that the unrotated first factor explained 39.830% of the variance, which was less than 40%, indicating that there was no significant common method bias in this study.<sup>34</sup>

Depressive symptoms were assessed with the patient health questionnaire (PHQ), which was developed by Kroenke in the 2021.<sup>35</sup> It is composed of 9 questions with the answer for each item is (1) not at all, (2) several days, (3) more than half the days, and (4) nearly every day, on a scale of 0–3, respectively. The summed score ranges from 0 to 27, higher score denotes more serious depressive symptoms. In this study, the Cronbach's alpha for the PHQ-9 was 0.90.

Interpersonal sensitivity was measured using the subscale of symptom checklist 90 (SCL-90), which was developed by Derogatis in the 1976.<sup>36</sup> It contains nine items, each with the options of each item is (1) never, (2) mild, (3) medium, (4) severe, and (5) very severe, on a scale of 0–4, respectively. The summed score ranges from 0 to 36, higher the total

score denotes more severe the interpersonal sensitivity symptoms, which means the more serious the interpersonal relationship problems. In this study, the Cronbach's alpha for the SCL-90 was 0.91.

Psychological Capital was measured using the Chinese version of the Zhang Psychological Capital Questionnaire (PCQ-26),<sup>37</sup> which was developed by Luthans et al in the 2007.<sup>38</sup> It contains 26 items, divided into self-efficacy (7 items), resilience (7 items), hope (6 items), and optimism (6 items) four dimensions, each with the options of each item is (1) strongly disagree, (2) disagree, (3) slightly disagree (4) not clear (5) slightly agree, (6) agree, and (7) strongly agree, which is scored from 1 to 7 points. The sum of the four factors scores is the total score of positive psychological capital, and the higher the total score, the higher the individual's psychological capital. In this study, the Cronbach's alpha for the PCQ-26 was 0.95. Cronbach's alpha for self-efficacy, hope, resilience, and optimism scales in this survey was 0.85, 0.88, 0.82, and 0.88, respectively.

### Demographic Variables

Demographic information regarding gender, age, residence, grade, discipline and only child or not were obtained. Age team was divided into  $< 20$  and  $\geq 20$ . Residence was categorized as rural or urban. Grade was divided into freshman, sophomore, junior, and senior. Discipline was categorized as science and engineering, social science and humanity.

### Statistical Analysis

Group differences in continuous variables were examined by *t*-tests and one-way ANOVAs. Descriptive statistics were used by mean and standard deviation. Pearson's correlation analysis was used to examine correlations among continuous variables. We used Model 4<sup>39</sup> to explore the mediating role of PsyCap and its dimensions between interpersonal sensitivity and depressive symptoms. SPSS v24.0 was employed to analyze the data and all significance tests were two-sided. PROCESS v3.4 macro developed by Hayes was to examine test proposed linkages between variables. Depressive symptoms were modeled as dependent variables, interpersonal sensitivity as independent variable, and PsyCap and its dimensions as mediators.

## Results

Harman's single-factor test analysis indicated that the variance explained by the first factor was 39.83%, which was less than the threshold of 40%. Participant characteristics were shown in Table 1. Among 2580 respondents, 1799 (69.73%) were females, with an average age of  $(19.22 \pm 1.28)$  years. Men reported higher interpersonal sensitivity ( $p < 0.01$ ), self-efficacy ( $p < 0.05$ ) and resilience ( $p < 0.001$ ) than women. The participants who were aged  $\geq 20$  reported lower self-efficacy ( $p < 0.01$ ), resilience ( $p < 0.05$ ), and PsyCap ( $p < 0.05$ ) than those aged  $< 20$ . For freshman ( $p < 0.001$ ) and sophomores ( $p < 0.01$ ) reported higher interpersonal sensitivity than seniors. Those who live in urban areas reported higher self-efficacy ( $p < 0.001$ ), resilience ( $p < 0.05$ ), and PsyCap ( $p < 0.001$ ) than those who live in rural areas. Only child was less likely than non-only child for interpersonal sensitivity ( $p < 0.05$ ), but only child was more likely than non-only child for PsyCap ( $p < 0.01$ ), self-efficacy ( $p < 0.001$ ), hope ( $p < 0.01$ ) and resilience ( $p < 0.01$ ). In addition, discipline of participants was not related to any model variables in our study ( $p > 0.05$ ). Optimism and depressive symptoms were also not related to any sociodemographic characteristics in our study ( $p > 0.05$ ).

### Correlations Between Continuous Variables

Correlations between continuous variables are presented in Table 2. Interpersonal sensitivity was positively depressive symptoms ( $p < 0.001$ ), indicating that the higher the performance of interpersonal sensitivity, the higher the perceived depressive symptoms. Interpersonal sensitivity and depressive symptoms were negatively correlated with PsyCap and its components ( $p < 0.001$ ), indicating that the greater the interpersonal sensitivity, the worse the performance of PsyCap and its components and the higher depressive symptoms.

**Table 1** Sociodemographic Characteristics and the Distributions of Model Variables in Categorical Items

Variables	N (%)	Interpersonal Sensitivity	Psychological Capital	Self-Efficacy	Hope	Resilience	Optimism	Depressive Symptoms
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Sex								
Male	781(30.27)	10.53(7.27)**	127.85(26.03)	33.12(7.69)*	31.09(7.13)	32.70(7.43)***	30.93(7.06)	4.49(4.82)
Female	1799(69.73)	9.63(6.49)	126.62(24.58)	32.41(7.52)	31.50(6.26)	31.44(7.34)	31.27(6.52)	4.40(4.09)
Age								
<20	1662(64.42)	10.05(6.68)	127.77(24.86)*	32.92(7.48)**	31.42(6.59)	32.09(7.38)*	31.34(6.67)	4.39(4.29)
≥20	918(25.58)	9.63(6.87)	125.58(25.30)	32.08(7.74)	31.31(6.45)	31.33(7.37)	30.85(6.73)	4.51(4.51)
Residence								
Urban	1589(61.59)	9.72(6.78)	128.00(25.26)**	33.18(7.58)***	31.51(6.54)	32.10(7.45)*	31.21(6.88)	4.49(4.48)
Rural	991(38.41)	10.18(6.70)	125.37(24.56)	31.73(7.51)	31.18(6.52)	31.37(7.26)	31.09(6.38)	4.34(4.06)
Grade								
Freshman (1)	1194(46.28)	10.41(6.79)***	127.21(25.44)	32.72(7.72)	31.36(6.75)	31.96(7.48)	31.17(6.83)	4.41(4.27)
Sophomore (2)	494(19.15)	9.99(6.78)**	127.77(23.20)	32.77(6.96)	31.71(5.94)	31.80(7.12)	31.47(6.26)	4.50(4.42)
Junior (3)	318(12.32)	9.72(6.78)	124.46(24.84)	32.13(7.66)	30.98(6.41)	30.88(7.02)	30.46(6.80)	4.65(4.49)
Senior (4)	574(22.25)	8.86(6.50)	127.28(25.77)	32.58(7.76)	31.35(6.63)	32.06(7.58)	31.28(6.70)	4.28(4.27)
Posterior comparisons		(1)>(4),(2)>(4)						
Discipline								
Science and engineering	1637(63.45)	9.83(6.86)	127.03(25.34)	32.64(7.68)	31.37(6.60)	31.87(7.43)	31.15(6.78)	4.40(4.28)
Social science	414(16.05)	10.24(6.37)	127.55(24.55)	32.85(7.43)	31.26(5.58)	32.16(7.17)	31.27(6.40)	4.27(4.49)
Humanity	529(20.50)	9.86(6.70)	126.99(25.03)	32.38(7.38)	31.51(6.30)	31.40(7.41)	31.14(6.64)	4.64(4.33)
Only child								
Yes	1168(45.27)	9.55(6.78)	128.80(25.86)**	33.32(7.85)***	31.79(6.66)**	32.25(7.49)**	31.43(6.98)	4.31(4.38)
No	1412(54.73)	10.18(6.71)*	125.50(24.24)	32.05(7.30)	31.04(6.41)	31.46(7.28)	30.94(6.44)	4.53(4.28)

Notes: \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

**Table 2** Bivariate Correlations Among Study Variables

	M(SD)	1	2	3	4	5	6
<b>1. Interpersonal sensitivity</b>	9.90 (6.75)	I					
<b>2. Self-efficacy</b>	32.62(7.58)	-0.616***	I				
<b>3. Hope</b>	31.38(6.54)	-0.510***	0.729***	I			
<b>4. Optimism</b>	31.17(6.69)	-0.528***	0.741***	0.768***	I		
<b>5. Resilience</b>	31.82(7.39)	-0.646***	0.787***	0.628***	0.646***	I	
<b>6. Psychological Capital</b>	126.99(25.03)	-0.651***	0.924***	0.872***	0.883***	0.870***	I
<b>7. Depressive Symptoms</b>	4.43(4.32)	0.646***	-0.561***	-0.528***	-0.546***	-0.582***	-0.625***

Note: \*\*\**p* < 0.001.

## Mediating Role of PsyCap on the Associations of Interpersonal Sensitivity with Depressive Symptoms

The effect of all variables was shown in Table 3. Figure 1 indicates that pathways of interpersonal sensitivity with depressive symptoms through PsyCap for college students. Interpersonal sensitivity exerted significant direct effects ( $\beta = 0.416$ , 95%Boot CI [0.380, 0.453],  $p < 0.001$ ), indirect effect ( $\beta = 0.231$ , 95%Boot CI [0.198, 0.265],  $p < 0.001$ ) and total effect ( $\beta = 0.647$ , 95% Boot CI [0.618, 0.677],  $p < 0.001$ ) on depressive symptoms, which means that between interpersonal sensitivity and depressive symptoms, PsyCap plays a partial mediating role. Hope (indirect effect = 0.056, 95%Boot CI [0.028, 0.086],  $p < 0.001$ ), optimism (indirect effect = 0.074, 95%BootCI [0.043, 0.106],  $p < 0.001$ ) and resilience (indirect effect = 0.099, 95%Boot CI [0.059, 0.136],  $p < 0.001$ ), significantly mediated the association between interpersonal sensitivity and depressive symptoms. The indirect pathways of interpersonal sensitivity with depressive symptoms through the four components of PsyCap are depicted in Figure 2.

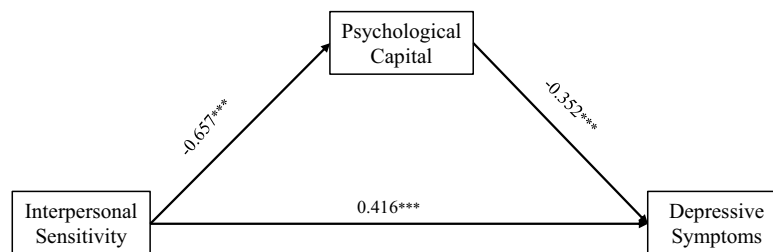
**Table 3** Direct, Indirect, and Total Path Effects from Interpersonal Sensitivity to Depressive Symptoms

Effects	Pathways	$\beta$	S.E.	$p$	95% CI	
					LLCI	ULCI
Direct effects	Interpersonal Sensitivity $\rightarrow$ Psychological Capital	-0.657	0.015	< 0.001	-0.686	-0.628
	Psychological Capital $\rightarrow$ Depressive Symptoms	-0.352	0.019	< 0.001	-0.388	-0.315
	Interpersonal Sensitivity $\rightarrow$ Depressive Symptoms	0.416	0.019	< 0.001	0.380	0.453
	Interpersonal Sensitivity $\rightarrow$ Self-efficacy	-0.621	0.015	< 0.001	-0.651	-0.590
	Interpersonal Sensitivity $\rightarrow$ Hope	-0.513	0.017	< 0.001	-0.547	-0.480
	Interpersonal Sensitivity $\rightarrow$ Resilience	-0.655	0.015	< 0.001	-0.684	-0.626
	Interpersonal Sensitivity $\rightarrow$ Optimism	-0.530	0.017	< 0.001	-0.563	-0.497
	Self-efficacy $\rightarrow$ Depressive Symptoms	0.002	0.028	0.946	-0.052	0.056
	Hope $\rightarrow$ Depressive Symptoms	-0.110	0.024	< 0.001	-0.156	-0.064
	Resilience $\rightarrow$ Depressive Symptoms	-0.151	0.024	< 0.001	-0.199	-0.103
	Optimism $\rightarrow$ Depressive Symptoms	-0.140	0.024	< 0.001	-0.187	-0.093
Indirect effects	Interpersonal Sensitivity $\rightarrow$ Psychological Capital $\rightarrow$ Depressive Symptoms	0.231	0.017	< 0.001	0.198	0.265
	Interpersonal Sensitivity $\rightarrow$ Self-efficacy $\rightarrow$ Depressive Symptoms	-0.001	0.019	0.986	-0.039	0.037
	Interpersonal Sensitivity $\rightarrow$ Hope $\rightarrow$ Depressive Symptoms	0.056	0.014	< 0.001	0.028	0.086
	Interpersonal Sensitivity $\rightarrow$ Resilience $\rightarrow$ Depressive Symptoms	0.099	0.020	< 0.001	0.059	0.136
	Interpersonal Sensitivity $\rightarrow$ Optimism $\rightarrow$ Depressive Symptoms	0.074	0.016	< 0.001	0.043	0.106
Total effects	Interpersonal Sensitivity $\rightarrow$ Depressive Symptoms	0.647	0.015	< 0.001	0.618	0.677

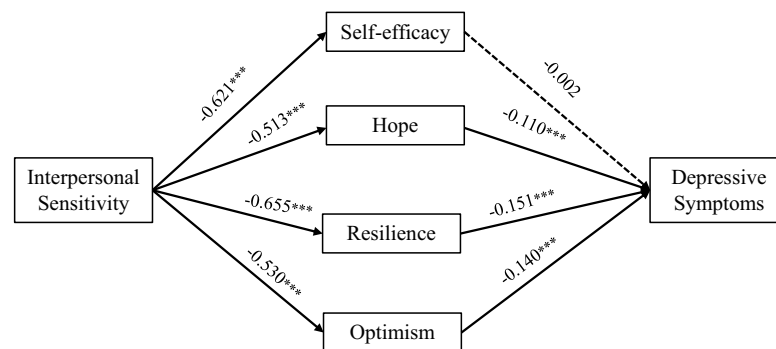
## Discussion

The aim of this study is to identify differences in interpersonal sensitivity, depressive symptoms, PsyCap, and its dimensions across different socio-demographic characteristics, and to explore the role of PsyCap, self-efficacy, hope, optimism, and resilience in mediating the relationship between interpersonal sensitivity and depressive symptoms among Chinese college students. The results of this study suggest that PsyCap partially mediates the relationship between interpersonal sensitivity and depression, and that hope, optimism, and resilience significantly reduce depression caused by interpersonal sensitivity.

The results of the current study show that male college students have significantly higher levels of interpersonal sensitivity than female college students, about which existing studies have come to conflicting conclusions. Some studies believe that there is no difference between males and females in interpersonal sensitivity,<sup>40,41</sup> while the study of adolescent mental health noted a significantly higher incidence of psychological problems in females than in males, including interpersonal sensitivity.<sup>42</sup> The study of interpersonal sensitivity among undergraduate students during the epidemic period,<sup>43</sup> is consistent with our conclusion, which may be due to the influence of personality characteristics, social environment and cultural background. Men's self-esteem may be higher than women's<sup>44</sup> so men may be more afraid of being rejected by others or hearing negative comments from the outside world, and are reluctant to show a vulnerable side of themselves to the outside world. This study shows that male university students have significantly higher self-efficacy and resilience than female university students, which may be due to the fact that males are often



**Figure 1** The mediating model. Independent variable: Interpersonal Sensitivity; Dependent variable: Depressive Symptoms; Mediating variables: Psychological Capital. \*\*\* $p < 0.001$ .



**Figure 2** The multiple mediating model. Independent variable: Interpersonal Sensitivity; Dependent variable: Depressive Symptoms; Mediating variables: Self-efficacy, Hope, Resilience, Optimism. \*\*\* $p < 0.001$ .  
**Notes:**  $\rightarrow p < 0.05$ .  $\dashrightarrow p > 0.05$ .

perceived as needing to take on more responsibility in society. Freud's theory of personality structure suggests that the human ego is often affected by the real society<sup>45</sup> when faced with knotty problems or frustrations, males are more inclined to show confidence in solving the problem and the ability to take on the responsibility. Moreover, in a study of marathon runners, mental toughness was highly correlated with self-efficacy,<sup>46</sup> which may be the reason why both variables were significant in this study.

Our study also found that lower-age college students had higher overall PsyCap scores, self-efficacy, and resilience than higher-age college students. Li and Xiao<sup>47</sup> using a self-administered PsyCap questionnaire yielded an overall higher total PsyCap score for junior college students than for senior college students, which is consistent with our findings. The younger students had not been in university for a long time and generally had positive attitudes toward their college studies, so there may be less burnout. Previous studies have shown that burnout is negatively correlated with PsyCap,<sup>48</sup> which may be one of the reasons why the younger students had higher PsyCap scores. The vast majority of the younger students are in the lower grades and have relatively few learning difficulties, as they learn a basic amount of knowledge, mostly within the public curriculum. Most of the goals set are easy to achieve and subjective well-being is high, which may lead to high self-efficacy.<sup>49</sup> In addition, university students over the age of 20 may be less resilient because they are mostly in their senior years and face the pressure of graduation and examination for graduate school, which may cause them to have higher anxiety, and high levels of anxiety may reduce resilience.<sup>50</sup>

In the study, college students living in urban areas had higher overall PsyCap scores and significantly higher scores for self-efficacy and resilience than those living in rural areas. Given that students from rural areas generally have lower family socioeconomic status than students from urban areas. Students with poorer family socioeconomic status have lower family life satisfaction, which leads to low self-esteem.<sup>51</sup> Conservation of resources theory<sup>52</sup> suggests that the resources an individual possesses do not exist independently of each other but are interconnected and that low self-esteem is associated with lower self-efficacy. Moreover, social capital is higher in urban areas, and higher social capital means that individuals have access to more resources in the group, thus increasing resilience.<sup>53</sup>

According to the data analyzed in this study, freshmen and sophomores have higher interpersonal sensitivity scores than juniors, which may be because freshmen and sophomores have not yet fully adapted to the new university environment and are not good at communicating with unfamiliar people, so interpersonal relationships are slow to be established, whereas most of the juniors have established stable interpersonal relationships after a longer accumulation of time. Meanwhile, a study shows that interpersonal sensitivity is related to family factors<sup>54</sup> however, most freshmen and sophomores live alone for a shorter period of time than juniors, and they may be more dependent on their families and have higher separation anxiety, and the absence of their parents for a short period of time does not allow them to make close friends, which will make them feel lonely, and the higher the loneliness, the higher the interpersonal sensitivity.<sup>55</sup>

In our study, although total PsyCap scores, self-efficacy, hope, and resilience were significantly higher in only children than in non-only children, non-only children were found to have higher interpersonal sensitivity than only children. Previously, a study of Chinese gay men's interpersonal sensitivity also pointed out that gay men who were the

only ones in their families were more likely to have high interpersonal sensitivity.<sup>56</sup> This may be since only-child families are under less pressure to raise their children and that most only-child parents have more time and energy to focus on their children's upbringing than non-only-child parents, thus most of the only-child children have sufficient resources to develop their strengths and hobbies. Moreover, there are usually more one-child families in urban areas than in rural areas, and the educational expectations of urban families are generally higher than those of rural areas.<sup>57</sup> Most one-child families are more concerned about their children's future development, so parents in these families will support and help their children to set future goals, as well as counselling and motivating their children to achieve them. One study pointed out that the scores of social withdrawal and low self-esteem of non-only-child college students were significantly higher than those of only-child students,<sup>58</sup> indicating that non-only-child students have difficulties in establishing good interpersonal relationships and often feel uncomfortable in interpersonal interactions due to low self-esteem. In general, only children are more likely to receive lasting parental affection than non-only children. Parents of non-only children may sometimes compare their children with each other, but too much competition and comparison may make non-only children feel frustrated, which may affect their self-confidence and resilience.

Interpersonal sensitivity showed a positive correlation with depressive symptoms in university students in this study, and this result is consistent with previous research findings.<sup>12,13,59</sup> Furthermore, previous research has shown that interpersonal sensitivity can predict early psychiatric problems.<sup>60</sup> Therefore, we can focus on preventing depression caused by interpersonal sensitivity and provide moderate mental health education and internet-based psychological interventions for college students with high interpersonal sensitivity.<sup>61</sup> Interpersonal sensitivity was negatively correlated with PsyCap, with higher interpersonal sensitivity being associated with lower PsyCap, which is consistent with previous research.<sup>21</sup> The emergence of interpersonal sensitivity is often accompanied by unconfident behavior<sup>39</sup> as well as low self-esteem,<sup>62</sup> which undoubtedly has a negative impact on an individual's PsyCap. In our study, we also found that PsyCap was negatively correlated with depressive symptoms, which is the same as the conclusion of a previous study,<sup>63</sup> and may be due to the fact that individuals with a high level of PsyCap have strong inner resources and are more capable of resisting external challenges and able to restore their own psychological state in a timely manner, which can alleviate the impact of negative emotions. In summary, our hypothesis 1 is verified that interpersonal sensitivity positively predicts depressive symptoms.

We validated the effect of interpersonal sensitivity on depression through the mediation effect of PsyCap, and the results of the study showed that PsyCap partially mediates the relationship between interpersonal sensitivity and depression, and that PsyCap mitigates the negative effects of interpersonal sensitivity on depression. This may be because PsyCap focuses on reducing over-sensitivity and fear caused by interpersonal sensitivity, and a good mental state can reduce the negative emotional effects of interpersonal sensitivity. Similarly, PsyCap has been found to be protective against psychological vulnerability,<sup>64</sup> which helps to increase the individual's ability to resist setbacks and reduce the emergence of negative emotions. This is also in line with the desperation principle in the theory of resource preservation.<sup>65</sup> When our own resources are depleted, we often enter a defensive state to protect ourselves.<sup>65</sup> This defense is irrational and aggressive, and interpersonal sensitivity may lead to poor interpersonal relationships among college students, which not only hinders their resource expansion but also causes resource damage, directly affecting the development of depressive emotions.<sup>21</sup> It can also affect the development of PsyCap and further aggravate depressive emotions. In summary, our hypothesis 2 is validated and PsyCap is able to partially mediate the relationship between interpersonal sensitivity and depressive symptoms.

Moreover, the components of hope, resilience, and optimism in PsyCap significantly mediated the indirect transmission pathways between interpersonal sensitivity and depression as analyzed by our data model. Ritschel et al in their latest study mentioned that hope was inversely associated with negative affect at the time of a cross-sectional study,<sup>25</sup> and Zhao et al found that hope and resilience were able to relieve depressive symptoms and alleviate negative affect,<sup>66</sup> similar to the results of our study. Hope can provide protection from depression that is brought on by university students who suffer from interpersonal sensitivities, allowing them to actively seek ways to cope and reduce the impact on their lives, thus reducing depressive symptoms.<sup>67</sup> The current study confirms that resilience partially mediates the relationship between interpersonal sensitivity and depression, which is the same as the study of Chinese university students during the COVID-19 blockade,<sup>13</sup> individual resilience enabled individual to confront difficulties positively, adjusted his/her



mindset in time, and repaired and recovered quickly when he/her was frustrated in facing external challenges. Resilience also partially mediates the interrelation between interpersonal interactions and depressive symptoms in rural children. By promoting the development of resilience, children's ability to deal with interpersonal communication can be improved, and the mental health of rural children can be enhanced<sup>68</sup> The results of the data in this study showed that optimism was able to reduce depression caused by interpersonal sensitivity, and that optimism was a protective factor against depression, allowing for positive attribution, rational regulation of inner emotions, and reduction of the negative effects of interpersonal sensitivity, which is consistent with the findings of Xie et al<sup>69</sup> in diabetic patients. Boehm et al also demonstrated that optimistic people have a lower risk of cardiovascular disease and cardiovascular-related death, and are more inclined to engage in healthier behaviors.<sup>70</sup> However, self-efficacy did not play a significant indirect mediating role in the relationship between interpersonal sensitivity and depression in our study, probably because the role of self-efficacy is not uniformly beneficial, and maintaining high levels of self-efficacy may lead to increased levels of psychological stress<sup>71</sup> while not effectively mitigating negative emotions. However, self-efficacy is a positive resource in most studies, and people with high levels of self-efficacy have good self-regulation of their emotions and are able to perceive more positive emotions.<sup>72</sup> Therefore, further investigations into the effects of different levels of self-efficacy on college students are needed to better understand the relationship between self-efficacy and negative emotions. Perhaps self-efficacy can play a partial moderating role in the relationship between interpersonal sensitivity and depressive mood. Unfortunately, our hypothesis 3 is only partially verified.

The current treatment methods for depressive mood have developed rapidly, and the emergence of various treatment methods has provided many options for the treatment of depressive mood. Moreover, many treatment methods can control other symptoms, such as anxiety, while treating depressive mood.<sup>73</sup> Although there are relatively complete treatments for depressive symptoms, there are still many shortcomings: currently, some treatment methods lack long-term efficacy.<sup>74</sup> The construction of enhancing the PsyCap of college students is indispensable. It not only helps improve their academic performance and build their academic skills, but also plays an important role in their mental health and reducing depression. This study provides a new approach to better alleviate depressive symptoms brought about by interpersonal sensitivity, and broadens the scope of application of PsyCap, which helps to improve the mental health of university students. As a positive psychological resource, PsyCap can be developed through a variety of means. In order to enhance the hope of college students, administrators can set reasonable future long-term goals for students, then break down the long-term goals into multiple short-term goals, and inspire students to achieve goals in different ways. When multiple short-term goals are achieved, college students' self-confidence will increase and their self-efficacy can be improved accordingly. In order to cultivate optimism, administrators should teach students to reasonably attribute positive events to the individual and negative events to the outside, so as to reduce stigma and alleviate depression.<sup>75</sup> Resilience in college students is positively correlated with positive emotions and that reducing social exclusion contributes to resilience.<sup>76</sup> College counselors should actively organize activities to help university students build good interpersonal relationships, thereby reducing social exclusion and increasing resilience. According to our research results, it is necessary to correctly understand and promote PsyCap. It is recommended that the school mental health department conduct lectures or offline interactions to tap into the rich resources within college students to resist external setbacks and harm, constantly engage in self-repair, build correct life plans, and actively and optimistically face life.

## Limitations

It must be acknowledged that this study has some limitations. First, the study participants were selected from only six universities, so there is limited possibility to extend the range of the results, and it is not representative of all university students, so further sampling with a larger sample size and scope should be done in the future. Secondly, the sample was selected from November to December, which is known to be the time when most students are about to enter the examination month or have already entered the examination month. Excessive study pressure may cause negative emotions to be higher than usual, which will have some effect on the final data. Thirdly, the self-rating scale used in this study may produce some bias in the measurement of interpersonal sensitivity, psychological capital and depression. Fourthly, in addition to college students, the negative emotions of emerging adults without higher education should also

receive more attention and deserve further exploration in future studies.<sup>77</sup> Finally, the method used in this study is a web-based cross-sectional survey. This means that even though we examined the association between interpersonal sensitivity and depression, we were not able to fully verify a causal relationship between the variables. For example, on the one hand, respondents may have previously suffered from depression, resulting in higher interpersonal sensitivity, and on the other hand, it is possible that respondents' higher interpersonal sensitivity may have contributed to depression, which should be explored in future longitudinal studies.

## Conclusions

This study explores the relationship between interpersonal sensitivity, PsyCap, and their four components (self-efficacy, hope, optimism, resilience) and depression among college students in the post epidemic era, which is different from previous findings. While previous studies have focused on the impact of COVID-19 on people's mental health, there seems to be less focus on the mental health of college students in the post-COVID-19 era. This study not only focused on a younger group of college students, but also extended the study of the specific effects of various dimensions of PsyCap on interpersonal sensitivity and depression. Interestingly, self-efficacy did not play a mediation role in the study of the relationship between interpersonal sensitivity and depression. The significance of this research paper mainly finds that psychological capital (hope, optimism, resilience) can mediate the relationship between interpersonal sensitivity and depression, which helps educators to focus on improving the positive psychological factors such as hope, optimism and resilience of college students to reduce the impact of negative emotions when regulating their mental health.

## Research Involving Human Participants Statement

The research was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethical Committee at Xuzhou Medical University.

## Data Sharing Statement

The data used in this study is available from the corresponding author Haibo Xu on request.

## Informed Consent

Informed consent was obtained from all individual participants included in the study.

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## Disclosure

The authors report no conflicts of interest in this work.

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