ORIGINAL RESEARCH

# The Relationship Between Character Strengths and Subjective Well-Being Among Chinese Impoverished College Students: The Chain Mediating Roles of Perceived Social Support and Positive Emotions

Chunrong Zuo[1,2], Nor Shafrin Ahmad[2], Lyu Zeng[1], Xiaogang Zhou[3], Feifei Li[2,4], Wuman Hong[2], Ping Gao[1]

[1]School of Education, Huainan Normal University, Anhui, 232038, People's Republic of China; [2]School of Educational Studies, Universiti Sains Malaysia, Gelugor, Penang, 11800, Malaysia; [3]College of Physical Education and Health Science, Zhejiang Normal University, Jinhua, 321000, People's Republic of China; [4]Department of Art, Shandong Agricultural University, Shandong, 271000, People's Republic of China

Correspondence: Nor Shafrin Ahmad, School of Educational Studies, Universiti Sains Malaysia, Gelugor, Penang, 11800, Malaysia, Tel +60 465 325 69, Email sham@usm.my; Xiaogang Zhou, College of Physical Education and Health Science, Zhejiang Normal University, Jinhua, 321000, People's Republic of China, Tel +86 183 2904 0923, Email brucechou123456@gmail.com

**Background and Objective:** The mental health of economically disadvantaged college students in China is notably inferior to that of their non-disadvantaged peers. As such, these students necessitate a broader spectrum of psychological support beyond mere financial assistance. Seligman's PERMA theory has established a compelling association between social support and positive emotions with subjective well-being. However, there is a scarcity of research focusing on character strengths within this framework, particularly the mechanisms that underlie their relationship. Hence, this study aims to examine the relationship between character strengths and subjective well-being among Chinese impoverished college students, while also delving into the chain mediating roles of perceived social support and positive emotions.

**Methods:** A convenience sampling method was employed to collect cross-sectional data from impoverished college students. Participants (N=336, Mean age=20.67) were assessed using four instruments: the Chinese Virtues Questionnaire (CVQ-96), the Perceived Social Support Scale (PSSS), the Positive and Negative Affect Scale (PANAS), and the Satisfaction with Life Scale (SWLS).

**Results:** Character strengths, perceived social support, positive emotions, and subjective well-being were all significantly positively correlated with each other (p<0.01). In addition, regression analysis indicated that character strengths positively predicted perceived social support (β=0.71, p<0.001), positive emotions (β=0.44, p<0.001), and subjective well-being (β=0.52, p<0.001). Perceived social support positively predicted positive emotions (β=0.34, p<0.001), and subjective well-being (β=0.44, p<0.001). Positive emotions positively predicted subjective well-being (β=0.88, p<0.001). Furthermore, chain mediation analysis revealed that character strengths influenced subjective well-being both directly and indirectly through perceived social support and positive emotions.

**Conclusion:** Perceived social support and positive emotions play a chain mediating role between character strengths and subjective well-being among impoverished college students.

**Keywords:** character strengths, perceived social support, positive emotions, subjective well-being, Chinese, impoverished college students

## Introduction

Impoverished college students are individuals whose financial resources are insufficient to cover their essential educational and living expenses.[1] These students can be classified into three levels of economic hardship: moderate poverty,

poverty, and extreme poverty. Within the realm of higher education funding and mental health initiatives, impoverished college students have become a primary focus. Research indicates that the mental health of Chinese impoverished college students is generally lower than that of non-impoverished students.[1] Providing them with financial assistance alone is no longer sufficient; it is crucial to pay attention to their intrinsic motivations and offer psychological support.[2] However, most previous research has primarily concentrated on investigating the psychological health issues among impoverished college students while overlooking their positive psychological factors. This approach does not facilitate a precise and comprehensive understanding of the dynamic development of the mental health of impoverished college students.[3] Consequently, transitioning from a negative to a positive psychology perspective is crucial for providing comprehensive and scientifically grounded psychological support to impoverished college students and enhancing their subjective well-being.

Subjective well-being, as a crucial criterion in the field of positive psychology, is also a prominent focus when studying the positive psychological health of impoverished college students, with a particular emphasis on the factors influencing the subjective well-being of these students.[4] Subjective well-being refers to individuals' overall assessment of their quality of life according to their self-defined standards, encompassing their cognitive evaluations of life satisfaction and their subjective experiences of emotional well-being.[5] Life satisfaction, along with positive and negative affect, constitutes the indicators used to measure subjective well-being.[6]

Previous research has found that character strengths are of significant importance and value in enhancing one's subjective well-being.[7,8] First and foremost, according to the definition of character strengths, they are relatively stable positive psychological traits manifested in an individual's cognition, behavior, and emotions.[9] Character strengths are expected to contribute to a fulfilling life for oneself and others. Furthermore, numerous studies have examined the relationships between character strengths and various indicators of well-being, such as hedonic well-being,[10–12] eudaimonic well-being,[13] and different orientations of well-being.[14,15] These studies provide evidence of the association between character strengths and well-being.[16] Additionally, some related research has confirmed that character strengths not only exhibit a significant positive correlation with subjective well-being but also play a crucial predictive role in an individual's subjective well-being.[17,18] Individuals with higher levels of character strengths often experience higher levels of subjective well-being,[19] and character strengths significantly enhance an individual's subjective well-being.[15] To examine the relationship between character strengths and subjective well-being among impoverished college students (Objective 1), we formulated Hypothesis 1: character strengths positively predict subjective well-being in this population.

Social support and positive emotions, respectively, also have strong relationships with subjective well-being, as confirmed within Seligman's PERMA theory framework. Seligman introduced the PERMA theory, which identifies the primary factors influencing an individual's subjective well-being, including positive emotions, engagement, relationships, meaning, and accomplishment.[20] However, there has been no research to date investigating the relationship between character strengths and various models of well-being orientations.[7] Social support refers to the network individuals establish with others in their interpersonal interactions, primarily involving family, relatives, friends, and other social groups and organizations. Within these social networks, individuals receive both material and psychological support.[21] The individual's perception and evaluation of this material or psychological support is referred to as "perceived social support". This support can reduce impoverished college students' perception of poverty and increase their life satisfaction.[22,23] Perceived social support is a positive subjective emotional experience of external emotional support, making individuals feel respected, supported, and understood.[24] According to the PERMA theory, perceived social support, as a subdomain of the social support concept, is positively correlated with positive psychological health outcomes. Perceived social support is of significant importance for positive psychology and psychological health,[25] and it is conducive to reducing symptoms of depression.[26]

Research has shown that character strengths are significantly positively correlated with perceived social support. Individuals with higher levels of character strengths often exhibit higher levels of perceived social support.[27] Perceived social support can positively predict subjective well-being, meaning that when individuals have higher levels of perceived social support, their subjective well-being also increases.[28] Therefore, perceived social support may serve as an important mediating pathway for character strengths to influence subjective well-being. To investigate the mediating role of perceived social support in the relationship between character strengths and subjective well-being among

impoverished college students (Objective 2), we formulated Hypothesis 2: perceived social support mediates the effect of character strengths on subjective well-being in this population.

The PERMA theory places positive emotions as the foremost element of happiness. Seligman regards his PERMA happiness theory framework as an integrative model that encompasses positive emotions, the satisfaction of individual desires, the meaning of life, and the realization of potential.[29] The Broaden-and-Build Theory of positive emotions also suggests that positive emotions can expand an individual's cognitive resources, thereby enabling more effective coping with complex situations and promoting the development of physiological, psychological, and social resources. The experience of problem-solving and the construction of various resources can lead to more positive emotional experiences for individuals. This is an ongoing and upward-spiraling process that continuously elevates an individual's level of positive emotions and significantly enhances their sense of happiness.[30] Research has confirmed that positive emotions are a necessary pathway to achieving subjective well-being, as experiencing more positive emotions can predict subjective well-being to some extent.[31] Furthermore, studies indicate that individuals with higher levels of character strengths often experience more positive emotional states.[32,33] To investigate the mediating role of positive emotions in the relationship between character strengths and subjective well-being among impoverished college students (Objective 3), we formulated Hypothesis 3: positive emotions mediate the effect of character strengths on subjective well-being in this population.

Building on Hypotheses 1, 2, and 3, this study introduces Hypothesis 4 to assess the chain mediation effect of perceived social support and positive emotions in the relationship between character strengths and subjective well-being (Objective 4). Hypothesis 4 posits that perceived social support and positive emotions play a chain mediating role in the influence of character strengths on subjective well-being among impoverished college students (see Figure 1 for the chain mediation model).

## Materials and Methods
### Participants and Procedure
A questionnaire survey was conducted utilizing a convenient sampling method during the "Poverty Alleviation Month Activity" at a university in Anhui Province, China. This study targeted impoverished college students as the research subjects. The inclusion criteria were students listed in the university's database of impoverished students, all participants in "Poverty Alleviation Month Activity" were from that database. The exclusion criteria were students who were not listed in the university's database of impoverished students. In the classroom where the activities were conducted, the survey was carried out by teachers who were trained to administer the questionnaires used in this survey. Regarding sample size calculators, G*Power was used to calculate the sample size in this study. With an effect size value of 0.10, a significance level of 0.05, statistical power of 0.80, a beta of 0.20, and 3 predictor variables in the regression analysis, the calculated sample size was 64. Therefore, a sample size of more than 64 impoverished college students is considered adequate for studying the variables and population. A total of 350 questionnaires were distributed, and 336 valid questionnaires were collected, resulting in an effective response rate of 96%. Among the respondents, there were 67 males (19.94%) and 269 females (80.06%). The participants' ages ranged from 18 to 24 years (20.32±0.52). The
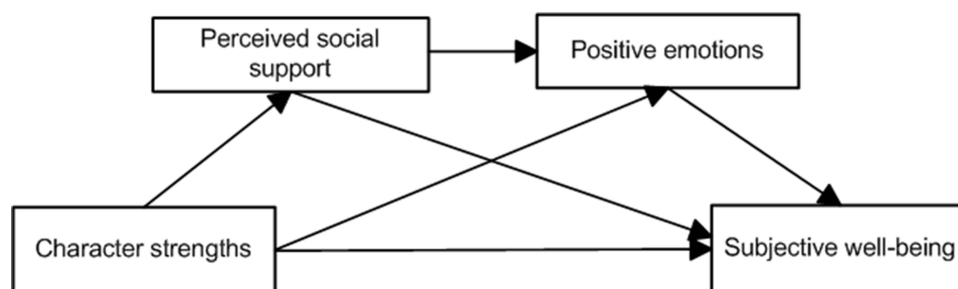


**Figure 1** The Chain Mediation Model.

distribution across academic years was as follows: Year 1 (97, 28.87%), Year 2 (106, 31.55%), Year 3 (101, 30.06%), and Year 4 (32, 9.52%).

## Measures

### Character Strengths

The Chinese Virtues Questionnaire (CVQ-96) revised by Duan, Ho, and Yuet al was used to assess character strengths.[34] The questionnaire comprises three dimensions: Affiliation, Vitality, and Willpower, totaling 96 items. Responses were scored on a Likert scale ranging from 1 ("Not at all like me") to 5 ("Very much like me") (eg, "I never give up until the task is completed"). Higher scores indicate more prominent character strengths. The internal consistency reliability of this scale in the current study was 0.96.

### Perceived Social Support

The Perceived Social Support Scale (PSSS) was translated and revised by Jiang.[35] The scale consists of 12 items, organized into three dimensions: Family Support, Friend Support, and Other Support. Responses were rated on a Likert scale ranging from 1 ("Strongly disagree") to 7 ("Strongly agree") (eg, "When I encounter problems, there are people (family members, friends, or colleagues) who are there for me"). Higher scores indicate higher levels of perceived social support. The internal consistency reliability of this scale in the current study was 0.92.

### Positive Emotions

The measurement of Positive Emotions was based on a portion of the Questionnaire of the Positive Affect and Negative Affect Scale (PANAS), specifically the section related to positive emotions. This scale was revised by Qiu, Zheng, and Wang, consisting of 18 items.[36] Responses were scored on a Likert scale ranging from 1 ("Very slightly or not at all") to 5 ("Extremely") (eg, "Active"), with higher scores indicating stronger positive emotions. The internal consistency coefficient of the positive emotion subscale in this study was 0.91.

### Subjective Well-Being

Previous studies have used the Satisfaction with Life Scale (SWLS) and the Positive Affect and Negative Affect Scale (PANAS) to respectively measure the cognitive and affective components of subjective well-being. The scores from these scales were standardized, and then the score of satisfaction with life was added to the score of positive affect and subtracted by the score of negative affect to create an index of subjective well-being. It was pointed out that subjective well-being includes both the cognitive and affective components.[37–40] Therefore, this study uses satisfaction with life, positive affect, and negative affect as the measurement indicators of subjective well-being. We can express this as a formula: Z (subjective well-being) = Z (life satisfaction) + Z (positive affect) - Z (negative affect). The Satisfaction with Life Scale (SWLS),[41] comprised five items, scored on a Likert scale ranging from 1 ("Strongly disagree") to 5 ("Strongly agree") (eg, "In most ways my life is close to my ideal"). The Positive Affect and Negative Affect Scale (PANAS)[36] used a Likert scale ranging from 1 ("Not at all") to 5 ("Very strongly"). The internal consistency reliabilities of the satisfaction with life, positive affect, and negative affect subscales were 0.74, 0.91, and 0.89, respectively.

## Research Procedure and Data Processing

Following the acquisition of informed consent from both the university administration and the participants, this study distributed paper-based questionnaires in the classroom. The primary examiner was a trained psychology professional. The students completed the questionnaires independently according to the provided instructions, ensuring the anonymity of all responses. Once completed, the questionnaires were promptly collected on-site. Data cleaning and statistical analysis were then conducted using SPSS 28.0.

Statistical methods employed SPSS 28.0 for performing descriptive statistics, and correlation analysis. Pearson's correlations were applied to determine the correlation coefficients between the variables. Harman's single-factor test was utilized to assess common method bias. Subsequently, the SPSS macro program was adopted, Model 6 according to the provided templates, and extracted 5000 samples with a default confidence interval of 95%, and the chain mediating

effects of perceived social support and positive emotions on character strengths and subjective well-being was examined. Statistically significant results were indicated by confidence intervals that excluded zero.[42]

# Results
## Descriptive Statistics of Variables

The demographic variables in this study include gender, age, current academic year, only child status, place of origin, major, expenses monthly, household per capita monthly income, and poverty levels. Table 1 shows the descriptive statistics for demographic variables across three variables.

## Comparison of Differences in Demographic Variables

After conducting a *t*-test, it was found that there were no significant differences in scores among binary demographic variables, such as gender, only child status, and household per capita monthly Income. After conducting an F-test, it was found that there were no significant differences in scores among non-binary demographic variables, including age, current academic year, major, and expenses monthly. However, there are some significant differences in two variables: place of origin and poverty levels.

Firstly, in terms of the place of origin, there were no significant differences in character strengths and life satisfaction among impoverished college students from different places of origin. However, significant differences were found in perceiving social support (p=0.02, p<0.05) and positive emotions (p=0.01, p<0.05). Post hoc tests revealed that, in terms

**Table 1** Descriptive Statistics of Demographic Variables (M±SD)

| Demographic Variables | Categorization | N(%) | Character Strengths | Perceived Social Support | Positive Emotions | Life Satisfaction |
|---|---|---|---|---|---|---|
| Gender | Male | 67(19.94%) | 346.92±35.42 | 62.19±11.25 | 24.97±6.73 | 14.64±3.52 |
| | Female | 269(80.06%) | 345.51±38.07 | 62.09±11.28 | 24.49±7.24 | 14.30±3.46 |
| Age (years old) | 18≤Age<19 | 33(9.82%) | 338.12±32.35 | 59.35±10.15 | 23.64±6.57 | 14.24±3.48 |
| | 19≤Age≤21 | 245(72.92%) | 347.00±36.89 | 62.26±11.01 | 24.46±7.15 | 14.33±3.47 |
| | 22≤Age≤24 | 58(17.26%) | 345.09±42.61 | 63.05±12.77 | 25.69±7.36 | 14.60±3.54 |
| Current Academic Year | Year1 | 97(28.87%) | 345.16±35.06 | 62.11±11.10 | 24.23±6.58 | 14.36±3.65 |
| | Year2 | 106(31.55%) | 346.21±39.21 | 61.44±11.13 | 23.98±7.71 | 14.17±3.56 |
| | Year3 | 101 (30.06%) | 342.06±37.88 | 61.65±12.26 | 24.83±7.09 | 14.33±3.30 |
| | Year4 | 32(9.52%) | 358.15±36.87 | 65.79±8.25 | 26.94±6.72 | 15.19±3.20 |
| Only Child Status | Only child | 52(15.48%) | 345.30±37.52 | 61.42±11.24 | 24.94±6.44 | 14.27±3.30 |
| | Not an only child | 284(84.52% | 345.89±37.58 | 62.24±11.28 | 24.52±7.26 | 14.39±3.51 |
| Place of Origin | Rural | 278(82.74%) | 347.30±38.17 | 62.68±11.34 | 25.03±7.20 | 14.53±3.49 |
| | Town | 37(11.01%) | 341.86±32.60 | 61.43±10.14 | 23.70±5.13 | 13.86±3.01 |
| | Urban | 21(6.25%) | 332.71±35.19 | 55.81±10.49 | 20.38±7.99 | 13.14±3.81 |
| Major | 1 Humanities | 227(67.56%) | 344.57±36.88 | 61.92±10.77 | 24.45±6.89 | 14.19±3.33 |
| | 2 Science & Engineering | 91(27.08%) | 348.28±41.06 | 62.49±12.74 | 24.95±7.91 | 14.66±3.82 |
| | 3 Arts & Sports | 18(5.36%) | 348.67±25.66 | 62.67±9.74 | 24.56±6.30 | 15.22±3.32 |
| Expenses Monthly | ≤ CNY 500 | 30(8.93%) | 344.32±27.61 | 62.44±11.94 | 26.07±5.91 | 14.20±3.43 |
| | CNY 500 to 1000 | 255(75.89%) | 346.96±39.78 | 62.17±11.20 | 24.58±7.21 | 14.43±3.46 |
| | ≥ CNY 1000 | 51(15.18%) | 340.86±30.23 | 61.61±11.38 | 23.78±7.40 | 14.18±3.62 |
| Household Per Capita Monthly Income | ≤ CNY 1000 | 175(52.08%) | 348.37±38.46 | 63.24±10.60 | 24.91±7.19 | 14.49±3.33 |
| | > CNY 1000 | 161(47.92%) | 343.00±36.37 | 60.89±11.85 | 24.24±7.08 | 14.24±3.63 |
| Poverty Level | 1 General Poverty | 95(28.27%) | 340.02±34.58 | 61.34±11.16 | 23.13±6.82 | 14.36±3.33 |
| | 2 Poverty | 119(35.42%) | 350.12±42.19 | 62.67±12.03 | 25.50±8.07 | 14.40±3.73 |
| | 3 Extreme Poverty | 122(36.31%) | 346.07±34.44 | 62.17±10.60 | 24.84±6.22 | 14.34±3.34 |

**Abbreviations**: M, mean; SD, standard deviation.

**Table 2** Comparative Analysis of Differences in the Place of Origin (M±SD)

| | Place of Origin (M±SD) | | | F-test | | Multiple Mean Comparison |
|---|---|---|---|---|---|---|
| | Rural (n=278) | Town (n=37) | Urban (n=21) | F | P | |
| 1 Character Strengths | 347.31±38.17 | 341.86±32.60 | 332.71±35.19 | 1.71 | 0.18 | |
| 2 Perceived Social Support | 62.68±11.34 | 61.43±10.14 | 55.81±10.49 | 3.77* | 0.02 | Rural>Urban |
| 3 Positive Emotions | 25.03±7.20 | 23.70±5.13 | 20.38±7.99 | 4.55* | 0.01 | Rural>Urban |
| 4 Life Satisfaction | 14.53±3.49 | 13.86±3.01 | 13.14±3.81 | 2.01 | 0.14 | |

**Notes**: *$p < 0.05$.
**Abbreviations**: M, mean; SD, standard deviation.

of perceived social support and positive emotions, there were no significant differences between impoverished college students from rural areas and town areas, as well as between those from urban areas and town areas. However, impoverished college students from rural areas had a greater perception of social support compared to those from urban areas, and similarly, impoverished college students from rural areas had higher levels of positive emotions compared to those from urban areas. Please refer to Table 2 for specific details.

Furthermore, in terms of poverty levels, there were no significant differences in character strengths, life satisfaction, and perceived social support. However, there was a significant difference in positive emotions ($p=0.048$, $p<0.05$). Post hoc tests revealed that there were no significant differences in the positive emotions between impoverished college students at the poverty level and those at the extreme poverty level, as well as between general poverty level and extreme poverty level students. However, the positive emotions of poverty level students were notably higher compared to those of general poverty level impoverished college students, as depicted in Table 3.

## Test for Common Method Bias

Given that this study utilized a "self-report methodology" for data collection from impoverished college students, it raises the possibility of potential common method bias. To assess the presence of common method bias, we conducted Harman's single-factor test.[43] The results indicated that there were 33 factors with eigenvalues greater than 1, collectively explaining 69.25% of the variance. The factor accounting for the highest variance explained was 22.50%, falling below the critical threshold of 40%. This outcome indicates that there is no significant concern regarding common method bias in this study.

## Correlation Analysis of Variables

According to the calculation formula of subjective well-being,[37–40] the scores of variables should be converted into Z-scores first. Then, the Z-score of subjective well-being equals the Z-score of life satisfaction plus the Z-score of positive effect and minus the Z-score of negative effect. Finally, the correlation between demographic variables and the key variables should be analyzed.

**Table 3** Comparative Analysis of Differences in Poverty Levels (M±SD)

| | Poverty Levels | | | F-test | | Multiple Mean Comparison |
|---|---|---|---|---|---|---|
| | General Poverty (n=95) | Poverty (n=119) | Extreme Poverty (n=122) | F | P | |
| 1 Character Strengths | 340.02±34.58 | 350.12±42.19 | 346.07±34.44 | 1.93 | 0.15 | |
| 2 Perceived Social Support | 61.34±11.16 | 62.67±12.03 | 62.17±10.60 | 0.37 | 0.69 | |
| 3 Positive Emotions | 23.13±6.82 | 25.50±8.07 | 24.84±6.22 | 3.07* | 0.048 | Poverty>General Poverty |
| 4 Life Satisfaction | 14.36±3.33 | 14.40±3.73 | 14.34±3.34 | 0.01 | 0.99 | |

**Notes**: *$p < 0.05$.
**Abbreviations**: M, mean; SD, standard deviation.

Table 4 shows the correlation coefficients of the variables. Character strengths were significantly positively correlated with perceived social support (r=0.71, p<0.01), positive emotions (r=0.69, p<0.01), and subjective well-being (r=0.71, p<0.01). Perceived social support was significantly positively correlated with positive emotions (r=0.66, p<0.01) and subjective well-being (r=0.69, p<0.01). Positive emotions were significantly positively correlated with subjective well-being (r=0.75, p<0.01).

Among demographic variables, only place of origin is significantly correlated with perceived social support (r=−0.14, p<0.05), positive emotions (r=−0.16, p<0.01), and subjective well-being (r=−0.13, p<0.05). Place of origin should be used as a control variable, while gender, age, and other demographic variables are not significantly correlated with the four variables.

## Chain Mediation Effect of Perceived Social Support and Positive Emotions

Given the significant correlations among the four variables, the possibility of multicollinearity exists, which may lead to unstable analysis results. Therefore, in this study, standardization (z-scores) and collinearity diagnostics were applied to all predictor variables in each equation. In data analysis, VIF (Variance Inflation Factor) and tolerance are test values used to measure whether there is a multicollinearity problem among variables. It is generally required that VIF < 3 or VIF < 5, and tolerance > 0.1, to be considered acceptable, indicating that there is no severe multicollinearity problem.[44] The results indicated that the variance inflation factor (VIF) for all predictor variables (ranging from 2.04 to 2.47) was less than 3, and the tolerance values (ranging from 0.41 to 0.49) were greater than 0.1. Thus, severe multicollinearity issues were not present in the data, making it suitable for further testing the chain mediation effect.

Model 6 in PROCESS V3.2[44] was used to examine whether perceived social support and positive emotions mediated the relationship between character strengths and subjective well-being. Character strengths serve as the independent variable, subjective well-being as the dependent variable, perceived social support and positive emotions as sequential mediating variables, and place of origin as the control variable. A total of 5000 bootstrap samples were drawn with a default confidence interval of 95%.

Regression analysis revealed that (as shown in Table 5 below), character strengths significantly positively predicted perceived social support (β=0.71, p<0.001); positive emotions (β=0.44, p<0.001); subjective well-being (β=0.52, p<0.001); perceived social support significantly positively predicted positive emotions (β=0.34, p<0.001); subjective well-being (β=0.44, p<0.001); positive emotions significantly positively predicted subjective well-being (β=0.88, p<0.001).

Based on the above analysis, the correlation analysis initially established significant relationships among the four variables. The regression analysis confirmed the significance of the paths from the independent variable to the mediator and from the mediator to the dependent variable, indicating that the key prerequisites for mediation have been validated. This allows for further testing of the potential chain mediation effect and the examination of indirect effects within each model.

Table 6 and Figure 2 display the chain-mediated effect model with a significant total effect (Effect = 1.43, 95% CI [0.00, 1.28]) and direct effect of character strengths on subjective well-being (Effect = 0.52, 95% CI [0.00, 0.32]), and hypothesis 1 was supported. The total indirect effect of character strengths on subjective well-being was significant

**Table 4** Correlation Analysis of Variables

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1 Gender | 1 | | | | | | |
| 2 Age | −0.04 | 1 | | | | | |
| 3 Place of Origin | −0.10 | −0.07 | 1 | | | | |
| 4 Character Strengths | −0.02 | 0.03 | −0.1 | 1 | | | |
| 5 Perceived Social Support | −0.003 | 0.08 | −0.14* | 0.71** | 1 | | |
| 6 Positive Emotions | −0.03 | 0.08 | −0.16** | 0.69** | 0.66** | 1 | |
| 7 Subjective Well-being | −0.03 | 0.06 | −0.13* | 0.71** | 0.69** | 0.75** | 1 |

**Notes**: *p < 0.05, **p < 0.01.

**Table 5** Regression Analysis of Character Strengths, Perceived Social Support, and Positive Emotions on Subjective Well-Being

| Predictor Variables | Outcome Variable: Perceived Social Support | | | Outcome Variable: Positive Emotions | | | Outcome Variable: Subjective Well-being | | |
|---|---|---|---|---|---|---|---|---|---|
| | β | t | 95% CI | β | t | 95% CI | β | t | 95% CI |
| 1 Place of Origin<br>2 Character Strengths<br>3 Perceived Social Support<br>4 Positive Emotions | −0.12<br>0.71 | −1.78<br>18.45*** | [−0.26, 0.01]<br>[0.63, 0.78] | −0.12<br>0.44<br>0.34 | −1.79<br>8.33***<br>6.31*** | [−0.26, 0.01]<br>[0.34, 0.55]<br>[0.23, 0.44] | −0.01<br>0.52<br>0.44<br>0.88 | −0.07<br>5.04***<br>4.39***<br>9.07*** | [−0.25, 0.23]<br>[0.32, 0.72]<br>[0.24, 0.64]<br>[0.69, 1.07] |
| $R^2$<br>F | 0.51<br>176.75*** | | | 0.54<br>130.10*** | | | 0.65<br>156.81*** | | |

**Notes**: ***$p < 0.001$. N=336. The data have all been standardized before entering the model.

(Effect = 0.91, 95% CI [0.74, 1.09]). The perceived social support mediating effect was significant (Effect = 0.31, 95% CI [0.16, 0.47]), and hypothesis 2 was supported. The indirect effect of the mediating role of positive emotions was significant (Effect = 0.39, 95% CI [0.26, 0.53]), therefore hypothesis 3 was supported. The chain mediating effect of perceived social support and positive emotions was equally significant (Effect = 0.21, 95% CI [0.13, 0.30]), and hypothesis 4 was also supported.

Specifically, the mediation effect consists of three main pathways:

1. Indirect Pathway 1 (Character Strengths → Perceived Social Support → Subjective Well-being).
2. Indirect Pathway 2 (Character Strengths → Positive Emotions → Subjective Well-being).
3. Indirect Pathway 3 (Character Strengths → Perceived Social Support → Positive Emotions → Subjective Well-being).

The effect sizes of these three indirect pathways are 0.31, 0.39, and 0.21, respectively, accounting for 21.68%, 27.27%, and 14.69% of the total effect. The 95% Bootstrap confidence intervals for these three indirect pathways do not include 0, indicating that the mediation effects of all three pathways are statistically significant.

# Discussion
## Insights from the Comparison of Impoverished College Students from Different Origins and Poverty Levels

The students' rural or urban origins have an impact on the perceived social support and positive emotions of impoverished college students. Impoverished college students from rural backgrounds tend to have higher levels of perceived social support and positive emotions compared to their urban-origin counterparts. This discovery provides

**Table 6** Chain Mediation Effect Test of the Mediating Role of Perceived Social Support and Positive Emotions in the Relationship Between Character Strengths and Subjective Well-Being

| | Effect | Boot SE | Boot LLCI | Boot ULCI | Relative Mediation Effect |
|---|---|---|---|---|---|
| Indirect Effect 1 | 0.31 | 0.08 | 0.16 | 0.47 | 21.68% |
| Indirect Effect 2 | 0.39 | 0.07 | 0.26 | 0.53 | 27.27% |
| Indirect Effect 3 | 0.21 | 0.04 | 0.13 | 0.30 | 14.69% |
| Total Indirect Effect | 0.91 | 0.09 | 0.74 | 1.09 | 63.64% |
| Direct Effect | 0.52 | 0.10 | 0.00 | 0.32 | 36.36% |
| Total Effect | 1.43 | 1.43 | 0.00 | 1.28 | |

**Abbreviations**: Boot SE, Boot LLCI, and Boot ULCI represent the standard error, lower limit, and upper limit of the 95% confidence interval of the bias-corrected percentile Bootstrap method for estimating indirect effects.
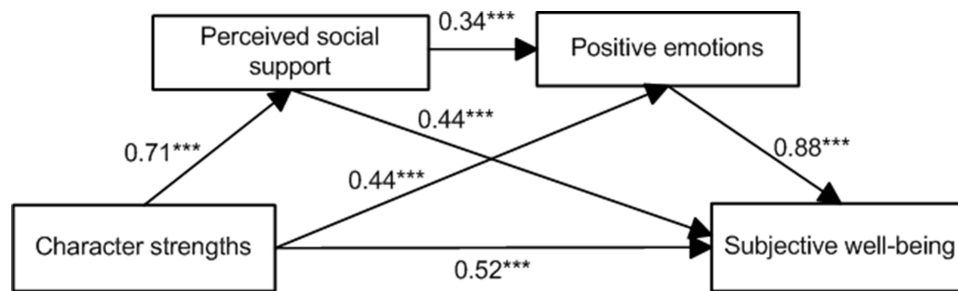
**Figure 2** Chain Mediation Effect of Perceived Social Support and Positive Emotions.
**Notes**: ***P<0.001.

valuable insights for education policies and mental health interventions, suggesting a need to focus more on urban-origin impoverished college students in financial aid and psychological support programs. By providing additional social support and positive emotion training, these students can better adapt to university life, improve their mental well-being, and enhance their subjective well-being.

Furthermore, it's worth noting that the positive emotions of impoverished college students appear significantly higher than those of general impoverished students. This difference may be attributed to the fact that both groups face similar material and psychological challenges. However, those who meet the specific criteria for poverty standards among college students may receive more financial and social support, leading to a greater experience of positive emotions. This highlights the importance of giving more attention and care to generally impoverished college students, irrespective of their poverty levels, and not neglecting efforts to provide them with both material and psychological support.

## Relationship Between Character Strengths and Subjective Well-Being Among Impoverished College Students

This study focused on impoverished college students as a special group and examined the relationship between character strengths and subjective well-being. The results indicate character strengths play a positive predictive role in subjective well-being, achieving Objective 1. These findings shed light on the intrinsic mechanisms underlying subjective well-being and offer insights into enhancing the subjective well-being and mental health levels of impoverished college students. The results of this study align with those of previous research.[16] The ability of character strengths to positively predict the subjective well-being of impoverished college students might be attributed to the higher levels of character strengths allowing individuals to better recognize their strengths. They often exhibit better adaptability to various stresses and stressful events in life, which can trigger their self-protective mechanisms. As a result, individuals adopt more positive cognitive and coping strategies, leading to greater positive experiences and ultimately higher levels of subjective well-being.[45] This study suggests that these positive experiences are likely to be the mediating mechanism influencing the relationship between character strengths and subjective well-being among impoverished college students. Therefore, once the relationship between character strengths and subjective well-being among impoverished college students is established, it becomes imperative to delve into the mediating mechanisms within this relationship.

## Mediating Role of Perceived Social Support

This study revealed that perceived social support partially mediates the relationship between character strengths and subjective well-being among impoverished college students, consistent with prior research. This result confirmed that perceived social support plays a mediating role between character strengths and subjective well-being, attaining Objective 2. Character strengths and high levels of perceived social support contribute to increased subjective well-being for individuals.[46] In the context of impoverished college students, the mediating role of perceived social support in the relationship between character strengths and subjective well-being might be attributed to the inherent positive psychological characteristics linked with higher levels of character strengths. Consequently, this facilitates the establishment of positive and close interpersonal relationships, leading to positive emotional experiences. As a result, they are

more likely to perceive and receive social support from their social networks, which provides them with both material and psychological assistance, leading to higher levels of subjective well-being. This process facilitates the further development of positive psychological traits and the experience of more positive emotions, establishing a virtuous cycle that consistently elevates their subjective well-being.

## Mediating Role of Positive Emotions

This study found that character strengths can also influence subjective well-being through the indirect effect of positive emotions, realizing Objective 3.This result supports the relevant theory of the "top-down model".[47] This model assumes that happiness is a general tendency derived from an individual's stable personality traits, which influence how individuals interpret life events in positive or negative ways. On one hand, individuals with prominent character strengths can enhance their positive emotional experiences and further reinforce their positive psychological traits. On the other hand, experiencing more positive emotions empowers individuals to obtain a higher level of subjective well-being.

## Chain Mediation Effect of Perceived Social Support and Positive Emotions

This study revealed a chain mediation effect of perceived social support and positive emotions in the relationship between character strengths and subjective well-being among impoverished college students, achieving Objective 4. This means that character strengths can indirectly influence subjective well-being through the sequential mediating effects of perceived social support and positive emotions. These pathways indicate that the impact of character strengths on subjective well-being is not only direct but also operates indirectly through the mediating variables of perceived social support and positive emotions. This suggests that character strengths influence subjective well-being through multiple mechanisms. Since the 95% Bootstrap confidence intervals for all three indirect pathways do not include 0, it indicates that these mediation effects are statistically significant. This further confirms that the impact of character strengths on subjective well-being through these pathways is reliable and can be used to guide practical interventions and support measures. Based on the main effects model of social support and the emotion event theory, perceived social support can effectively enhance an individual's positive emotional experiences. As an essential psychological resource, perceived social support helps individuals maintain a positive emotional state. Individuals with higher levels of perceived social support are more likely to keenly perceive the support they receive from external sources, both materially and psychologically, which clarifies their strengths and enhances their positive emotional experiences when facing adversity. Moreover, individuals with higher levels of perceived social support tend to choose positive self-regulation strategies to enhance positive emotions.[48] Consequently, they often experience higher levels of subjective well-being.

In summary, the findings of this study confirm the significance of positive emotions in the relationship between character strengths and subjective well-being, as outlined in the PERMA theory. However, there is still ongoing debate regarding whether character strengths and the five factors of PERMA (positive emotions, engagement, relationships, meaning, and accomplishment), independently contribute to subjective well-being, or if character strengths generate subjective well-being through the mediating effects of PERMA. Therefore, the most significant innovation of this study lies in providing insight into exploring how character strengths generate happiness through the mediating effects of PERMA. This has implications for investigating the specific mechanisms through which character strengths influence subjective well-being, designing targeted training programs, and effectively enhancing individuals' subjective well-being. For example, intervention programs can be designed to enhance character strengths, thereby boosting perceived social support and positive emotions, which in turn can improve subjective well-being. Such a comprehensive intervention may be more effective than focusing solely on one aspect.

## Limitations and Future Research Directions

This study used a sample of 336 impoverished Chinese college students to investigate the relationship between character strengths and subjective well-being, as well as the mediating chain effect of perceived social support and positive emotions. The findings have important implications for enhancing impoverished college students' perceived social support, positive emotions, and subjective well-being. The results suggest that in future psychological support for impoverished college students, it is essential to focus on the cultivation of character strengths. This can help

impoverished college students improve their perceived social support and positive emotions, ultimately enhancing their subjective well-being. However, this study has some limitations that need further improvement in future research.

First, in terms of the analysis of differences in demographic variables, when analyzing the differences in character strengths, subjective well-being, perceived social support, and positive emotions among impoverished college students in relation to demographic variables, the potential differences in the following demographic variables were considered: gender, age, current academic year, only child status, place of origin, major, monthly expenses, household per capita monthly income, and poverty levels. These questions were included in the initial part of the questionnaire for participants to fill out. However, the researchers found it challenging to control for the balance of sample sizes across each dimension of these variables and could not guarantee that the sample sizes in each dimension were statistically significant, which could potentially affect the results of the difference analysis. In the future, it would be beneficial to concentrate on a few key demographic variables when administering the questionnaire to improve control over the balance of sample sizes.

Second, in terms of data collection, the study used questionnaires for data collection, which falls under cross-sectional research. Therefore, it is not possible to establish causal relationships between character strengths and subjective well-being. In the future, longitudinal research could be employed to examine the directional impact of character strengths, perceived social support, positive emotions, and subjective well-being. For example, by conducting follow-up studies at several important time points over the course of four years of college with the same group of participants, it is possible to establish different timelines for tracking research. Intervention studies can also be conducted to gain a more comprehensive and detailed understanding of the influence of character strengths on subjective well-being. Furthermore, although the questionnaire for character strengths has been simplified, it still consists of 96 items, and the extensive number of questions may induce participant fatigue. In the future, it is desirable to use a questionnaire with a reduced number of items while maintaining high validity and reliability to mitigate these potential effects.

Third, in terms of sampling, this study employed a convenience sampling method, and the participants were from the same university without comparisons with other universities or provinces. This may limit the generalizability of our findings. In the future, it is necessary to recruit participants from diverse populations to make the sample more representative. Additionally, this study solely focused on impoverished college students, and non-impoverished college students were not included. Future research could encompass non-impoverished college students and compare the relationship between character strengths and subjective well-being in these two categories of college students.

## Conclusion

The findings of our study have revealed several notable relationships between character strengths, perceived social support, positive emotions, and subjective well-being among Chinese impoverished college students. Notably, character strengths exhibit both significant direct and indirect effects on subjective well-being. More specifically, the character strengths can directly influence their subjective well-being. Furthermore, they exert indirect impacts on subjective well-being through the mediating factors of perceived social support and positive emotions. These indirect effects manifest through three distinct pathways: firstly, through the mediating role of perceived social support; secondly, through the mediating role of positive emotions; and thirdly, through the chain mediating effect of perceived social support and positive emotions. These findings indicate that university mental health educators can design comprehensive intervention programs to enhance character strengths among impoverished college students, thereby increasing perceived social support, which in turn boosts positive emotions and improves subjective well-being. Such a comprehensive intervention approach is likely to be more effective.

## Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon request.

## Ethics Statement

This study adheres to the principles outlined in the 1964 Declaration of Helsinki and its subsequent amendments. Approval was granted by the Universiti Sains Malaysia's official Ethics Committee, Jawatankuasa Etika Penyelidikan Manusia (JEPeM), before commencement (Ethical code: USM/JEPeM/PP/23100795). To ensure participants' informed

consent, written agreements were obtained prior to their involvement in the study. These agreements not only confirmed their willingness to participate but also their consent for the publication of study findings without revealing their identities. Participation was restricted to adults, specifically college students aged 18 years and older, eliminating the necessity for parental consent. Informed consent was directly obtained from all participants involved.

## Disclosure

The authors report no conflicts of interest in this work.

## References

1. Yuan XH, Hu SW, Yang Y, Peng J. Meta-analysis of the mental health status of poor college students in China. *Occupat Health*. 2022;38 (19):2712–2716. doi:10.13329/j.cnki.zyyjk.20220429.005
2. Fu AG, Yue T, Hou GH. From poverty eradication to revitalization: theoretical gaps and research path in the endogenous drive of the population in ethnic minority areas. *J Ethnol*. 2022;13(09):108–118+164.
3. Chen MY, Li K, Huang L, Guo Y. The effect of personal goal on SWB of impoverished undergraduates. *Psychol Explor*. 2020;40(04):372–376.
4. Lin ZZ. The influence of family support on the subjective well-being of impoverished college students: the mediating role of positive psychological traits. *J Bingt Educat Instit*. 2022;32(2):43–47.
5. Diener E, Lucas RE. Subjective emotional well-being. In: Lewis M, Haviland JM, editors. *Handbook of Emotions*. Guilford Press; 2000:325–337.
6. Busseri MA, Sadava SW. Subjective well-being as a dynamic and agentic system: evidence from a longitudinal study. *J Happiness Stud*. 2013;14:1085–1112. doi:10.1007/s10902-012-9368-9
7. Wagner L, Gander F, Proyer RT, Ruch W. Character strengths and PERMA: investigating the relationships of character strengths with a multidimensional framework of well-being. *Appl Res Qual Life*. 2020;15:307–328. doi:10.1007/s11482-018-9695-z
8. Gillham J, Adams-Deutsch Z, Werner J, et al. Character strengths predict subjective well-being during adolescence. *J Posit Psychol*. 2011;6 (1):31–44. doi:10.1080/17439760.2010.536773
9. Peterson C, Seligman ME. *Character Strengths and Virtues: A Handbook and Classification*. Oxford University Press; 2004.
10. Berthold A, Ruch W. Satisfaction with life and character strengths of non-religious and religious people: it's one's religion that makes the difference. *Front Psychol*. 2014;5(876). doi:10.3389/fpsyg.2014.00876
11. Martínez-Martí ML, Ruch W. Character strengths predict resilience over and above positive affect, self-efficacy, optimism, social support, self-esteem, and life satisfaction. *J Posit Psychol*. 2017;12:110–119. doi:10.1080/17439760.2016.1163403
12. Ruch W, Proyer RT, Harzer C, et al. Values in action inventory of strengths (VIA-IS). *J Individ Differ*. 2010:19. doi:10.1027/1614-0001/a000022
13. Goodman FR, Disabato DJ, Kashdan TB, Machell KA. Personality strengths as resilience: a one-year multiwave study. *J Pers*. 2017;85 (3):423–434. doi:10.1111/jopy.12250
14. Buschor C, Proyer RT, Ruch W. Self-and peer-rated character strengths: how do they relate to satisfaction with life and orientations to happiness? *J Posit Psychol*. 2013;8(2):116–127. doi:10.1080/17439760.2012.758305
15. Peterson C, Ruch W, Beermann U, Park N, Seligman ME. Strengths of character, orientations to happiness, and life satisfaction. *J Posit Psychol*. 2007;2(3):149–156. doi:10.1080/17439760701228938
16. Hausler M, Strecker C, Huber A, et al. Distinguishing relational aspects of character strengths with subjective and psychological well-being. *Front Psychol*. 2017;8:8. doi:10.3389/fpsyg.2017.01159
17. Liu ML, Tian XZ, Guo XD. Character strengths and their consequences. *Advan Psycholog Sci*. 2018;26(12):2180–2191. doi:10.3724/SP. J.1042.2018.02180
18. Yu Y, Chotipanvithayakul R, Wichaidit W, Cai W. Effects of character strength-based intervention vs group counseling on post-traumatic growth, well-being, and depression among university students during the COVID-19 pandemic in Guangdong, China: a non-inferiority trial. *Psychol Res Behav Ma*. 2022;16:1517–1529. doi:10.2147/PRBM.S359073
19. Duan WJ, Xie D, Li L, et al. Current status, challenges, and prospects of character strengths and virtues research. *J Psycholog Sci*. 2016;2016:1.
20. Seligman M. PERMA and the building blocks of well-being. *J Posit Psychol*. 2018;13(4):333–335. doi:10.1080/17439760.2018.1437466
21. Cheng HJ, Fang XY, Lin XY. An investigative research on social support of undergraduates. *Chin J Clin Psychol*. 2005; 3:304–306+311.
22. Liu B, Fu S. Perceived poverty and life satisfaction in college students with impoverished backgrounds: the mediating role of self-esteem. *Psychol Res Behav Ma*. 2022;15:327–337. doi:10.2147/PRBM.S349907

23. Kong F, You X. Loneliness and self-esteem as mediators between social support and life satisfaction in late adolescence. *Soc Indic Res.* 2013;110:271–279. doi:10.1007/s11205-011-9930-6

24. Liu X, Huang XT. Death awareness: the function of sense of meaning and significance in hospice care. *Psycholog Res.* 2010;3(1):3–8+15.

25. Butler J, Kern ML. The PERMA-Profiler: a brief multidimensional measure of flourishing. *Internat J Wellb.* 2016;6(3):1–48. doi:10.5502/ijw.v6i3.526

26. He Y, Zeng Q, Zhang M. The mediating roles of future work self and hope on the association between perceived social support and depressive symptoms among Chinese vocational school students: a cross-sectional study. *Psychol Res Behav Ma.* 2023;16:2125–2136. doi:10.2147/PRBM.S414356

27. Wang YX, Li HP, Ding XT, et al. The relationship of character strengths, perceived social support to empathy of nursing undergraduates in a university of Hefei. *Mod Preventive Med.* 2018;45(12):2187–2190.

28. Gülaçtı F. The effect of perceived social support on subjective well-being. *Procedia Soc Behav Sci.* 2010;2(2):3844–3849. doi:10.1016/j.sbspro.2010.03.602

29. Goodman FR, Disabato DJ, Kashdan TB, Kauffman SB. Measuring well-being: a comparison of subjective well-being and PERMA. *J Posit Psychol.* 2018;13(4):321–332. doi:10.1080/17439760.2017.1388434

30. Fredrickson BL. The role of positive emotions in positive psychology: the broaden-and-build theory of positive emotions. *Am Psychol.* 2001;56(3):218. doi:10.1037/0003-066X.56.3.218

31. Wan Y, Zheng X, Yu XX. SWB and PWB: the integration of two well-being research orientations. *Stud Psychol Behav.* 2010;8(03):190–194.

32. Li TT. The influence of character strengths on affective well-being. *North Norm Univer.* 2016;2016:1.

33. Pang C, Geng RJ. Mediating role of positive emotions between character strengths and job burnout in community nurses. *Occup Health.* 2023;39(05):593–596. doi:10.13329/j.cnki.zyyjk.2023.0123

34. Duan W, Ho SM, Yu B, et al. Factor structure of the Chinese virtues questionnaire. *Res Soc Work Pract.* 2012;22(6):680–688. doi:10.1177/1049731512450

35. Wang XD, Wang XL, Ma H. Manual of the psychologi cal health assessment scale. *Chin J Ment Health Publish House.* 1999;1999:131–133.

36. Qiu L, Zheng X, Wang YF. Revision of the Positive Affect and Negative Affect Scale (PANAS). *Chin J Appl Psychol.* 2008;14(3):249–254.

37. Wang HZ, Jiang Q, Hou LL. The relationship between character strengths and subjective well-being among college students: the roles of strengths use and stressful life events. *Psycholog Develop Educ.* 2017;33(1):95–104. doi:10.16187/j.cnki.issn1001-4918.2017.01.11

38. Linley PA, Nielsen KM, Gillett R, Biswas-Diener R, Biswas-Diener R. Using signature strengths in pursuit of goals: effects on goal progress, need satisfaction, and well-being, and implications for coaching psychologists. *Internatl Coach Psychol Rev.* 2010;5(1):6–15. doi:10.53841/bpsicpr.2010.5.1.6

39. Govindji R, Linley PA. Strengths use, self-concordance and well-being: implications for strengths coaching and coaching psychologists. *Internatl Coach Psychol Rev.* 2007;2(2):143–153. doi:10.53841/bpsicpr.2007.2.2.143

40. Sheldon KM, Elliot AJ. Goal striving, need satisfaction, and longitudinal well-being: the self-concordance model. *J Person Soc Psychol.* 1999;76(3):482. doi:10.1037/0022-3514.76.3.482

41. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. *J Pers Assess.* 1985;49:71–75. doi:10.1207/s15327752jpa4901_13

42. Wen ZL, Ye BJ. Analyses of mediating effects: the development of methods and models. *Advan Psycholog Sci.* 2014;22(5):731–745. doi:10.3724/SP.J.1042.2014.00731

43. Harman HH. *Modern Factor Analysis.* 3rd ed. Chicago: University of Chicago Press; 1976.

44. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: a regression-based approach. *Guilf Publicat.* 2017;2017:1.

45. Zhou Y, Liu XP. Character strengths of college students: the relationship between character strengths and subjective well-being. *Psycholog Develop Educ.* 2011;27(05):536–542. doi:10.16187/j.cnki.issn1001-4918.2011.05.005

46. Ruan FY, Ding XT, Li HP, et al. A study on the relationships among character strengths, perceived social support and subjective well-being of breast cancer patients. *J Med Imaging Health Inform.* 2021;11(7):1967–1972. doi:10.1166/jmihi.2021.3493

47. Diener E. Subjective well-being. *Psychol Bull.* 1984;95(3):542. doi:10.1037/0033-2909.95.3.542

48. Bao XH, Huang J, Li N, et al. The influence of proactive personality on academic engagement: the chain-mediated effect of perceived social support and positive emotions. *Psychol Behav Res.* 2022;20(04):508–514.