Global Scientific and Academic Research Journal of Multidisciplinary Studies
ISSN: 2583-4088 (Online)
Frequency: Monthly
Published By GSAR Publishers
Journal Homepage Link- https://gsarpublishers.com/journals-gsarjms-home/

Research on the Relationship Between Mental Health and Positive Psychological Capital of College Students in Engineering Universities: Based on the Dual-Factor Model of Mental Health

By

LIU Bo[1] ,XU Cheng[1] ,Yang Liu[2]

[1]Southwest Petroleum University School of Economics and Management, Chengdu, Sichuan 610500, China
[2]Tianfu New District Aviation and Tourism Vocational College,Chengdu, Sichuan 610000, China

Article History

Received: 01/07/2026
Accepted: 06/07/2026
Published: 08/07/2026

Vol – 5 Issue –7

PP: - 06-11

Abstract

Based on the Dual-Factor Model of Mental Health (DFM), this study examines the association between positive psychological capital and mental health among 5,236 undergraduate students from a Chinese engineering university, using the SCL-90, SWLS, PANAS and PPQ scales. Results show that students can be classified into four groups: flourishing (58.72%), vulnerable (11.36%), symptomatic but content (22.15%), and distressed (7.77%), with DFM outperforming the traditional unidimensional model in classification accuracy. Positive psychological capital is at a medium-to-high level with significant gender and grade differences, and positively predicts subjective well-being while negatively predicting psychological symptoms. The findings verify DFM's applicability in engineering higher education and provide empirical implications for targeted mental health interventions. (148 words)

Keywords: *Dual-Factor Model of Mental Health; Positive Psychological Capital; Engineering Universities; College Students; Mental Health*

Introduction

"What kind of student is mentally healthy?" remains a core question for college mental health education and crisis intervention. For decades, Chinese universities have relied on unidimensional psychopathological assessment represented by the SCL-90 to screen students with psychological distress, focusing on identifying and treating negative symptoms[1]. While this model supports crisis early warning, it has notable limitations: students without clinical symptoms may still suffer from low subjective well-being and weak resilience, while those with mild symptoms may maintain normal social functioning through self-adjustment and social support. Overreliance on symptom screening may either overlook at-risk groups or overpathologize mild distress.

Against the backdrop of China's New Engineering Education Initiative, engineering universities bear the responsibility of cultivating high-quality technical talents for industrial transformation and technological innovation. Engineering students face intense academic pressure, strict practical requirements and fierce employment competition[2]. Coupled with the discipline's emphasis on rational logic over emotional expression, most students are reluctant to seek psychological help, making their mental health problems hidden and complex. The traditional unidimensional assessment can no longer fully capture their psychological status, calling for a bidimensional evaluation framework integrating both negative symptoms and positive strengths.

Proposed by Greenspoon and Saklofske in 2001, the Dual-Factor Model of Mental Health (DFM) redefines mental health as a complete state of low psychopathological symptoms plus high subjective well-being[3]. It divides the population into four groups: flourishing, vulnerable, symptomatic but content, and distressed. Existing studies have confirmed that DFM achieves higher predictive validity for social functioning and developmental outcomes than the traditional model[4]. As a core construct of positive psychology, positive psychological capital—consisting of self-efficacy, optimism, hope and resilience—serves as a protective factor for mental health, negatively predicting negative emotions and positively predicting life satisfaction. However, few studies have combined DFM with positive psychological capital to investigate engineering undergraduates.

This study applies DFM to analyze the mental health structure of engineering college students and explores its relationship with positive psychological capital, aiming to provide evidence for optimizing mental health assessment and intervention systems in engineering universities.

*Corresponding Author: **LIU Bo**

1. Literature Review and Research Framework

1.1 Literature Review

In 2001, Greenspoon and Saklofske first formally proposed the Dual-Factor Model of Mental Health (DFM), breaking the traditional cognition that "mental health equals the absence of mental illness" and defining mental health as a complete state of low psychopathological symptoms plus high subjective well-being[5]. The model takes psychopathological indicators as the negative dimension and subjective well-being as the positive dimension, and divides the population into four groups. Later, Suldo and Shaffer further improved the operational definition and measurement standards of the model based on youth groups, and verified that the model has better predictive validity for social function, academic performance and problem behaviors than the traditional unidimensional model[6]. A large number of foreign studies have confirmed that the dual-factor model can more accurately identify groups with different psychological states, make up for the evaluation bias of the unidimensional model, and provide a basis for stratified and classified mental health intervention[7].

Domestic scholars Wang Xinqiang et al. first introduced the dual-factor model into Chinese college student groups, verified the applicability of the model under Chinese cultural background, and found that compared with the traditional unidimensional model, the dual-factor model can more sensitively predict students' social function and development outcomes[8]. In recent years, some vocational colleges in China have applied this model to carry out student mental health screening, but empirical studies targeting engineering undergraduate universities are still relatively insufficient.

Positive psychological capital is a core concept in the field of positive psychology, referring to measurable and developable positive psychological states formed by individuals in the process of growth and development, including four core dimensions: self-efficacy, optimism, hope and resilience[9]. Existing studies have shown that positive psychological capital is an important protective factor for mental health, which can negatively predict negative emotions such as anxiety and depression, and positively predict life satisfaction and positive affect. For engineering college students, positive psychological capital is not only related to their mental health level, but also affects their frustration resistance and innovation potential in engineering practice[10]. However, most existing studies focus on vocational or comprehensive universities, and few systematically explore the relationship between positive psychological capital and different mental health types combined with the dual-factor model.

1.2 Research Framework

This study takes the Dual-Factor Model of Mental Health as the core theoretical basis, and constructs a research framework of "status description - type classification - correlation analysis - countermeasure proposal". First, it measures the negative psychological symptoms and positive psychological status of engineering college students through SCL-90 and subjective well-being scales respectively, and divides four types of mental health groups based on the dual-factor model. Second, it examines the overall level and demographic differences of positive psychological capital. Third, it analyzes the differences of positive psychological capital among different mental health groups and verifies its predictive effect on mental health level. Finally, it proposes optimization paths for mental health education in engineering universities combined with the research results.

2 Research Design

2.1 Research Objects

Using the cluster sampling method, full-time undergraduate students from a provincial engineering university in East China were selected as the research object, covering 6 engineering majors including Mechanical Engineering, Electrical Engineering, Computer Science and Technology, Civil Engineering, New Energy Science and Engineering, and Material Forming and Control Engineering, including three grades: freshman, sophomore and junior. A total of 5,600 questionnaires were distributed. After eliminating invalid questionnaires with regular responses and excessive missing answers, 5,236 valid questionnaires were recovered, with an effective recovery rate of 93.5%.

Demographic characteristics of the sample: 4,012 male students, accounting for 76.62%; 1,224 female students, accounting for 23.38%. There were 1,987 freshmen (37.95%), 1,765 sophomores (33.71%), and 1,484 juniors (28.34%). The age range was 17~22 years old, with an average age of 19.2 ± 1.15 years. There were 2,145 only children (40.97%) and 3,091 non-only children (59.03%). 2,409 students were from urban areas (46.01%) and 2,827 from rural areas (53.99%).

2.2 Research Instruments

2.2.1 Symptom Checklist 90 (SCL-90)

Compiled by Derogatis, this scale contains 90 items, covering 9 factors including somatization, obsessive-compulsive symptoms, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism, as well as additional items. It adopts a 1~5 rating scale, and higher scores indicate more severe psychological symptoms. In this study, a total score ≥ 160 or an average score of any factor ≥ 2 was used as the screening criterion for positive psychological symptoms. In this study, the internal consistency coefficient Cronbach's α of the scale was 0.935, and the α coefficient of each factor ranged from 0.782 to 0.896, indicating good reliability.

2.2.2 Satisfaction With Life Scale (SWLS)

Compiled by Diener et al., this scale is used to measure the cognitive component of subjective well-being. It contains 5 items and adopts a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). The total score ranges from 5 to 35, and higher scores indicate higher overall life satisfaction of individuals. In this study, the Cronbach's α of the scale was 0.927, indicating good reliability.

*Corresponding Author: **LIU Bo**

2.2.3 Positive and Negative Affect Schedule (PANAS)

Compiled by Watson et al., this scale includes two dimensions: positive affect and negative affect, with 9 items each, totaling 18 items. It adopts a 5-point rating scale (1 = very slightly or not at all, 5 = extremely), and the dimension scores of positive affect and negative affect are calculated respectively. In this study, the Cronbach's α of the positive affect dimension was 0.901, the Cronbach's α of the negative affect dimension was 0.889, and the α coefficient of the total scale was 0.918, which met the psychometric requirements.

2.2.4 Positive Psychological Capital Questionnaire (PPQ)

The revised Positive Psychological Capital Questionnaire by Zhang Kuo et al. (2010) was adopted, which includes 4 dimensions: self-efficacy, resilience, hope and optimism, with a total of 26 items. It adopts a 7-point Likert scale (1 = completely inconsistent, 7 = completely consistent). Higher total scores indicate higher level of individual positive psychological capital. In this study, the Cronbach's α of the total scale was 0.946, and the α coefficient of each dimension ranged from 0.825 to 0.903, with good reliability and validity.

2.3 Data Processing

SPSS 26.0 statistical software was used for descriptive statistics, independent samples t-test, one-way ANOVA, LSD post-hoc multiple comparison test and stepwise regression analysis. Amos 24.0 was used for confirmatory factor analysis to verify the structural validity of the scales. All tests adopted two-tailed tests, and the significance level was set at $\alpha = 0.05$.

3 Results

3.1 Overall Mental Health Status

3.1.1 Psychological Symptoms

Under the traditional unidimensional screening standard, 1,636 students tested positive for psychological symptoms, with a detection rate of 31.24%. The total mean score of SCL-90 was 1.48 (SD = 0.472), and all factor mean scores ranged from 1.31 to 1.73, below the clinical cutoff of 2. The top three scoring factors were obsessive-compulsive symptoms (M = 1.72, SD = 0.613), interpersonal sensitivity (M = 1.58, SD = 0.594) and depression (M = 1.51, SD = 0.568).

3.1.2 Subjective Well-Being

As shown in Table 3.1, life satisfaction and positive affect scores were significantly higher than the theoretical median ($p < 0.01$), while negative affect was significantly lower than the theoretical median ($p < 0.01$), indicating an overall high level of subjective well-being among participants. In total, 3,600 students (68.76%) were classified as having high subjective well-being, and 1,636 students (31.24%) as low subjective well-being.

Table 3.1 Descriptive Statistics of Subjective Well-Being

Item	Mean	SD	Median	Theoretical Median	t
Life Satisfaction	22.153	6.582	22.000	17.5	51.247**
Positive Affect	28.126	7.241	27.000	22.5	56.389**
Negative Affect	20.864	6.715	20.000	22.5	-18.752**

3.2 Mental Health Classification Based on DFM

Combining SCL-90 screening results and subjective well-being levels, four mental health groups were identified: (1) Flourishing (low symptoms, high well-being): 3,074 students (58.72%), with no obvious clinical symptoms and high life satisfaction. (2) Vulnerable (low symptoms, low well-being): 595 students (11.36%), without clinical symptoms but with low subjective well-being and potential crisis risk. (3) Symptomatic but content (high symptoms, high well-being): 1,160 students (22.15%), with mild psychological symptoms but maintained well-being and normal functioning. (4) Distressed (high symptoms, low well-being): 407 students (7.77%), with both prominent symptoms and low well-being, representing the key intervention group.

Notably, among the 1,636 symptom-positive students identified by the traditional model, only 407 fell into the distressed group requiring intensive intervention. Meanwhile, 595 symptom-free students classified as “healthy” by the traditional model were identified as vulnerable with potential psychological risks.

3.3 Positive Psychological Capital and Demographic Differences

The total mean score of positive psychological capital was 4.572 (SD = 0.913), at a medium-to-high level. Dimension scores ranked from high to low: optimism (M = 4.987, SD = 1.024), hope (M = 4.896, SD = 1.071), self-efficacy (M = 4.483, SD = 1.152), resilience (M = 4.198, SD = 0.865).

3.3.1 Gender Differences

As presented in Table 3.2, males scored significantly higher than females on total psychological capital, self-efficacy and optimism ($p < 0.01$). No significant gender differences were found in hope and resilience.

*Corresponding Author: **LIU Bo**

Table 3.2: Gender Differences in Positive Psychological Capital (M±SD)

Dimension	Male (n=4012)	Female (n=1224)	t	p
Total Score	4.59±0.92	4.51±0.89	2.764	0.006**
Self-Efficacy	4.52±1.16	4.37±1.12	4.081	0.000**
Optimism	5.01±1.03	4.92±1.00	2.715	0.007**
Hope	4.91±1.06	4.85±1.09	1.762	0.078
Resilience	4.21±0.87	4.16±0.85	1.809	0.071

3.3.2 Grade Differences

One-way ANOVA revealed significant grade differences in total psychological capital, self-efficacy and resilience ($p < 0.01$). Post-hoc tests showed that juniors scored significantly higher on resilience than freshmen and sophomores, and higher on self-efficacy than freshmen. No significant grade differences were observed in optimism and hope (Table 3.3).

Table 3.3 Grade Differences in Positive Psychological Capital (M±SD)

Dimension	Freshman(n=1987)	Sophomore(n=1765)	Junior (n=1484)	F	p
Total Score	4.52±0.93	4.58±0.90	4.64±0.91	7.892	0.000**
Self-Efficacy	4.41±1.17	4.50±1.14	4.56±1.15	7.215	0.001**
Optimism	4.97±1.04	5.00±1.02	4.99±1.01	0.536	0.585
Hope	4.88±1.08	4.90±1.06	4.92±1.07	0.784	0.457
Resilience	4.12±0.88	4.20±0.85	4.29±0.86	15.327	0.000**

3.4 Differences in Psychological Capital Across Mental Health Groups

One-way ANOVA showed that total psychological capital and all four dimensions differed significantly across the four mental health groups ($p < 0.001$). LSD post-hoc tests indicated that the flourishing group scored significantly higher than all other groups on all dimensions. No significant difference was found between the vulnerable group and the symptomatic but content group, and both scored significantly higher than the distressed group (Table 3.4).

Table 3.4 ANOVA of Positive Psychological Capital Across Mental Health Groups (M±SD)

Dimension	Flourishing(n=3074)	Vulnerable(n=595)	Symptomatic but Content(n=1160)	Distressed(n=407)	F	p	Post-hoc
Total Score	4.82±0.90	4.25±0.73	4.28±0.79	3.98±0.93	192.463	0.000**	①>②③>④
Self-Efficacy	4.81±1.15	4.05±0.97	4.09±1.00	3.75±1.09	205.178	0.000**	①>②③>④
Optimism	5.09±1.06	4.87±0.85	4.83±0.84	4.62±1.01	32.571	0.000**	①>②③>④
Hope	5.15±1.04	4.57±0.95	4.63±0.98	4.39±1.12	128.934	0.000**	①>②③>④
Resilience	4.34±0.88	3.91±0.76	3.94±0.79	3.68±0.87	147.625	0.000**	①>②③>④

Note: $p < 0.01$; ①=Flourishing, ②=Vulnerable, ③=Symptomatic but Content, ④=Distressed

3.5 Predictive Effect of Positive Psychological Capital

Stepwise regression analysis showed that all four dimensions of positive psychological capital positively predicted subjective well-being, jointly explaining 38.2% of the variance (adjusted $R^2 = 0.382$, $F = 812.347$, $p < 0.001$). When SCL-90 total score was set as the dependent variable, resilience, self-efficacy and hope entered the regression equation and negatively predicted psychological symptoms, explaining 21.7% of the variance (adjusted $R^2 = 0.217$, $F = 483.629$, $p < 0.001$).

4 Discussion

4.1 Application Value of the Dual-Factor Model of Mental Health

The results of this study show that the detection rate of positive psychological symptoms among engineering college students under the traditional unidimensional model is 31.24%, which is similar to the research results of most domestic engineering colleges. However, the classification results based on the dual-factor model present a richer psychological structure. Among them, the flourishing group accounts for 58.72%, which is the main body of the student

*Corresponding Author: **LIU Bo**

group; the distressed group accounts for 7.77%, which is the core object of crisis intervention.

The core value of the dual-factor model lies in identifying two types of groups misjudged by the unidimensional model: one is the vulnerable group accounting for 11.36%. These students are classified as "mentally healthy" in traditional assessment, but have low subjective well-being and insufficient psychological resilience, belonging to the sub-health state of "no symptoms but unhappiness". Engineering majors have high academic pressure and strong competitive atmosphere. Some students are under high pressure for a long time. Although they do not have clinical symptoms, they suffer from emotional exhaustion and lack of sense of meaning. If they do not receive attention for a long time, they are very likely to develop psychological disorders. The other is the symptomatic but content group accounting for 22.15%. Although these students have mild psychological symptoms, they can maintain high life satisfaction, belonging to the state of "having symptoms but still being happy". This may be related to the problem-solving oriented mindset of engineering students. Some students regard academic pressure and interpersonal distress as normal challenges, do not perceive them as serious psychological distress, and can obtain a sense of achievement and value through professional practice and scientific and technological innovation activities.

It can be seen that unidimensional symptom screening may not only miss potential vulnerable groups, but also overamplify the intervention demand for mild symptoms. Introducing the dual-factor model into the mental health survey of engineering universities can realize the shift of assessment from "presence or absence of disease" to "health degree", and improve the accuracy and scientificity of psychological screening.

4.2 Characteristics of Positive Psychological Capital Among College Students in Engineering Universities

This study finds that the overall positive psychological capital of engineering college students is at a medium-to-high level, among which the optimism and hope dimensions score higher, and the resilience dimension scores the lowest, which is consistent with the conclusions of existing studies. Freshmen have just entered university and are full of expectations for university life and future careers, so their optimism and hope levels are higher. Resilience needs to be gradually cultivated in the experience of setbacks. College students have little social experience and are prone to frustration when facing difficulties such as academic failure and interpersonal conflict, so their resilience level is relatively weak.

In terms of demographic differences, male students have significantly higher total positive psychological capital and self-efficacy scores than female students, which is related to gender stereotypes and perceived professional fit in the engineering field. The engineering field has long been dominated by male practitioners, and social culture has higher expectations for men's engineering ability. Male students are more likely to gain a sense of achievement and self-identity in professional study and practice. Female students are more likely to feel gender pressure in the engineering environment, and their professional self-efficacy is relatively low.

In terms of grade differences, junior students have significantly higher resilience and self-efficacy than freshmen, which conforms to the law of psychological development. As the grade increases, students experience multiple challenges such as professional study, competition practice, and internship experience, their experience in coping with setbacks continues to enrich, and their self-efficacy and psychological resilience gradually improve. However, it is worth noting that the optimism and hope dimensions have not improved significantly with grade, which may be related to the increasing employment pressure and further study pressure faced by senior students. Universities need to focus on career planning and employment psychological counseling for senior students.

4.3 Protective Mechanism of Positive Psychological Capital on Mental Health

This study confirms that positive psychological capital has significant differences among different mental health groups, and has a bidirectional predictive effect on mental health level: it can not only improve subjective well-being, but also alleviate psychological symptoms. This result supports the protective effect theory of positive psychological capital.

Specifically, students with high self-efficacy are more confident in their ability to solve academic and life problems, and tend to adopt positive problem-solving coping styles when facing difficulties, so they have fewer psychological symptoms and higher well-being. Students with high level of hope have clear goals and implementation paths, can maintain a sense of direction in stressful situations, and reduce hopelessness and depression. Optimistic students tend to make positive attributions to events, regard setbacks as temporary and local, so they can maintain high positive affect. Resilience is the core ability of individuals to recover from adversity. Students with strong resilience can quickly adjust their state even if they encounter negative events, and avoid the continuous deterioration of psychological symptoms.

For the symptomatic but content group, high positive psychological capital may be the key protective factor for them to maintain well-being. With positive qualities such as self-efficacy and resilience, they can still maintain good social function in the presence of psychological distress. Although the vulnerable group have no obvious symptoms for the time being, their level of positive psychological capital is low and their psychological protection barrier is weak. Therefore, improving the psychological capital of this group is the key entry point for preventing psychological crisis.

5 Implications for Mental Health Education

5.1 Establish a Bidimensional Assessment System

Engineering universities should integrate DFM into routine mental health screening to replace the single-dimension symptom-only model. By simultaneously measuring psychological symptoms and subjective well-being,

*Corresponding Author: **LIU Bo**

universities can classify students into four types and establish stratified psychological files. Differentiated follow-up strategies should be adopted: intensive crisis intervention for the distressed group, supportive counseling for the symptomatic but content group, preventive education for the vulnerable group, and developmental promotion for the flourishing group. A dynamic monitoring platform can be built to realize real-time early warning.

5.2 Implement Targeted Group Interventions

Tailored interventions should be designed for different groups. For distressed students, establish a multi-level early warning network and green referral channels with mental health institutions, providing long-term professional counseling. For vulnerable students, carry out group counseling on mindfulness, emotional awareness and social support to improve their sense of meaning and well-being. For symptomatic but content students, adopt a strength-based approach to enhance their existing coping strategies rather than overemphasizing pathology. For flourishing students, integrate positive psychology into curriculum and campus activities to consolidate their mental health advantages.

5.3 Systematically Cultivate Positive Psychological Capital

Universities should incorporate psychological capital cultivation into mental health education, targeting the four core dimensions. To improve self-efficacy, build a progressive practical teaching system and provide diversified success experiences, with special support for female engineering students. To foster hope, strengthen career planning education and guide students to set phased goals. To cultivate optimism, carry out positive attribution training combined with engineering failure cases. To enhance resilience, integrate frustration education into professional practice and train students' adversity coping skills.

5.4 Build a Collaborative Education Ecosystem

Break the isolation of mental health work by promoting the integration of mental health education, professional education and ideological-political education. Infuse psychological literacy into engineering courses and combine engineering ethics education with mental health guidance. Meanwhile, strengthen home-school collaboration and university-community cooperation, mobilizing family and social resources to form a full-support ecosystem for student mental health.

6 Conclusion

This study verifies the applicability of the Dual-Factor Model of Mental Health among engineering college students in China. The model achieves more accurate classification than the traditional unidimensional model by identifying vulnerable and symptomatic but content groups. Engineering students' positive psychological capital is at a medium-to-high level with significant gender and grade differences, and resilience remains the weakest dimension. Positive psychological capital acts as a protective factor, negatively predicting psychological symptoms and positively predicting subjective well-being, with significant differences across the four mental health groups.

Future research can expand the sample to more regions and conduct longitudinal tracking to explore the mediating and moderating mechanisms between psychological capital and mental health, so as to provide more robust evidence for engineering mental health education.

References

1. Sun, C. Q. Research on mental health status and education promotion strategies of students in engineering vocational colleges [J]. Journal of Zhejiang Institute of Communications, 2024, 25(2): 51-56.
2. Suldo, S. M., & Shaffer, E. J. Looking beyond psychopathology: The dual-factor model of mental health in youth [J]. School Psychology Review, 2008, 37(1): 52-68.
3. Wang, X. Q., Xie, Q., Zhang, D. J., et al. Validity of the dual-factor model of mental health in college students and their psychological suzhi [J]. Journal of Psychological Science, 2016, 39(6): 1296-1301.
4. Zhao, H. Current situation, influencing factors and cultivation countermeasures of college students' psychological capital [J]. Mental Health Monthly, 2024, 19(23): 121-123, 240.
5. Liu, Y. Y., Wu, S. J., Li, Y. Q., et al. Prevalence of psychological symptoms in Chinese population based on SCL-90 [J]. Chinese Mental Health Journal, 2018, 32(5): 437-441.
6. Wang, X. M., Ling, L., & Wang, X. An empirical investigation of mental health status of higher vocational students from the perspective of positive psychology: Based on the dual-factor model of mental health [J]. Modern Vocational Education, 2024(19): 137-140.
7. Fang, K., Liang, L., & Luo, X. Investigation and statistical analysis of college students' psychological capital [J]. Higher Education Exploration, 2016(10): 123-128.
8. Liu, H. P., Zhao, J. D., Jiao, L. T., et al. The effect of positive psychological capital on loneliness of freshmen: The mediating role of positive and negative affect [J]. Journal of Educational Biology, 2025, 13(5): 360-365.
9. Zhang, K., Zhang, S., & Dong, Y. H. Positive psychological capital: Measurement and its relationship with mental health [J]. Studies of Psychology and Behavior, 2010, 8(1): 58-64.
10. Lin, C. D., & Wang, Y. W. The integrated development of positive psychology and mental health education [J]. Journal of Beijing Normal University (Social Sciences), 2021(2): 78-88.

*Corresponding Author: **LIU Bo**