

Article

Psychological disorders and health-promoting lifestyle among Chinese college students: A comprehensive exploration

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Abstract: Objective: This study assessed the prevalence of psychological disorders and their correlation with health-promoting lifestyles among Chinese college students. **Method:** We used the Chinese version of the Depression Anxiety Stress Scales-21 (DASS-21) and the Health Promoting Lifestyle Profile II (HPLP-II) questionnaires. Gender and major differences were analyzed with the chi-square test, and multiple logistic regression explored the relationship between HPLP and psychological disorders. **Results:** Among 17,636 students, low prevalence rates were observed for stress (4.0%), depression (7.2%), and anxiety (15.4%). Females and students in humanities and social sciences reported higher rates of multiple psychological disorders. Higher HPLP scores were inversely correlated with depression (OR = 0.479, 95% CI: 0.376–0.609), anxiety (OR = 0.480, 95% CI: 0.408–0.565), and stress (OR = 0.821, 95% CI: 0.636–1.060) after adjusting for confounders. **Conclusions:** The study found low overall prevalence of psychological disorders, with higher rates among females and humanities/social sciences majors. Higher HPLP scores, particularly in interpersonal relationships and nutrition, are associated with a lower risk of mental disorders.

Keywords: psychological disorders; depression; anxiety; stress; lifestyle; college students

1. Introduction

Psychological disorders are considered serious public health concerns. Numerous studies have documented that individuals attending college exhibit more pronounced psychological disorders than those who do not (Cvetkovski et al., 2012; Ibrahim et al., 2013). This may be attributed to the subtle transition period of college students from relying on their parents to living independently, which requires them to face new living conditions, social relationships, academic challenges, and employment pressure (Deforche et al., 2015; Li, 2022; Parker et al., 2004). Depression, anxiety, and stress are the most prevalent psychological disorders among college students (Pedrelli et al., 2015). Those with depressive symptoms suffer from decreasing likelihood of self-efficacy (Yang et al., 2022), self-esteem (Kim and Moore, 2019), and family cohesion (Liu et al., 2023) as well as high degree of inferiority complex (Xu et al., 2011). Anxiety is also closely associated with a worse quality of life (Gan and Yuen Ling, 2019). Research on college students from different countries has revealed moderately high rates of depression, anxiety, and stress (Bahhawi et al., 2018; Fawzy and Hamed, 2017; Ramón-Arhués et al., 2020; Regehr et al., 2013). This situation imposes causes irreparable harm to the country, society, and families.

Although gender differences in psychological disorders among college students have long been the focus of cross-sectional and cohort studies, epidemiological studies have drawn no consistent conclusion. For example, some researchers found that

female undergraduates are more prone to experiencing unstable emotions and exhibit higher rates of anxiety and stress (Bayram and Bilgel, 2008; Fawzy and Hamed, 2017; Kavvadas et al., 2022; Xiong et al., 2020; Yu et al., 2022). By contrast, a few studies have indicated that male undergraduates suffer significantly more from depression, anxiety, and stress than female counterparts (Al-Qaisy, 2011; Chang et al., 2021; Li et al., 2020; Li et al., 2021). Furthermore, other studies have established that college students' psychological disorders are not significantly affected by gender (Chen et al., 2022; Gao et al., 2020; Grant et al., 2002). Additionally, depression, anxiety, and stress are interrelated and often co-occur (Bruce et al., 2005; Goodwin, 2015), which can lead to severe behavioral issues such as suicide among college students (Fu et al., 2023). However, to the best of our knowledge, no research has investigated the co-occurrence probabilities of depression, anxiety, and stress among college students of different genders and majors. This identification is crucial for promoting their overall well-being and devising targeted strategies, thereby contributing to the creation of a harmonious campus atmosphere.

Healthy behaviors have been identified as determinants of psychological well-being. Young adults who develop unhealthy behaviors may find these resonate throughout their lifespan and endanger their health status in later life (Nelson et al., 2008). Previous studies have indicated that engaging in unhealthy behaviors poses a risk for the development of psychological disorders. For example, college students with fewer outdoor and physical activities, decreased meal frequency, poor nutritional intake, and insufficient sleep were significantly associated with worse depression, anxiety, and stress symptoms (Keck et al., 2020; Mofatteh, 2021; Zhang et al., 2022). By contrast, health-promoting lifestyle patterns (HPLP) have been identified as an effective means of enhancing psychological well-being outcomes (Fukumoto et al., 2011; Zheng et al., 2020). However, few studies have explored the relationship between psychological disorders and HPLP among college students. Understanding regarding the degree of HPLP and its ultimate impact on psychological disorders among college students is limited.

In summary, this study used a large sample from a comprehensive university to investigate the prevalence of psychological disorders, assess the degree of HPLP, and explore the correlation between psychological disorders and HPLP among Chinese college students. To the best of our knowledge, this study is the first survey of the complications of psychological disorders in college students, considering variations in gender and major.

2. Materials and methods

2.1. Study design and participants

This cross-sectional study investigated freshmen from Southwest University (western region) and Zhengzhou University (eastern region) in October 2023. Participants were recruited through a combination of university-wide announcements and targeted invitations sent to incoming freshman students. Data were collected anonymously using online questionnaires to ensure privacy and encourage honest responses. After initial recruitment, 21,664 participants engaged with the online questionnaires. However, 4028 participants were excluded based on criteria such as

unwillingness to respond to questions related to psychological disorders ($n = 1183$), absence from major ($n = 789$), obviously fictitious or inconsistent responses ($n = 642$), or missing data ($n = 1414$), with missing data defined as incomplete or non-submitted questionnaires. Finally, 17,636 undergraduate participants aged between 16 and 22 years (mean age, 18.56 years; SD, 0.99) were included in the study.

2.2. Measurement instruments

2.2.1. Depression Anxiety Stress Scales-21 (DASS-21)

Psychological disorders were measured using the validated Chinese version of the Depression Anxiety Stress Scales-21 (DASS-21) (Cheung et al., 2016). The scale is an effective tool for measuring the severity of psychological disorders among Chinese college students and has good internal consistency (Cronbach’s alpha 0.89) (Gong et al., 2010). It contains 21 items self-report, 7 items per subscale: depression, anxiety, and stress. Each item is rated on a four-point Likert scale (ranging from “0” for “Did not apply” to “3” for “Very applied most of the time”). Subscale scores were calculated by summing individual scores and multiplying by two to align with the original DASS-42 scale score (Henry and Crawford, 2005). Scores for each subscale ranged from 0 to 42, with higher scores indicating more severe psychological disorders. Based on Lovibond’s categorization, the cutoff points are as shown in **Table 1** (Lovibond, 1995). Cronbach’s alpha values for the entire scale and its three subscales were 0.926, 0.907, 0.885, and 0.888, respectively.

Table 1. Score severity ratings of depression, anxiety, and stress symptoms.

	Depression	Anxiety	Stress
Normal	0–9	0–7	0–14
symptomatic			
Mild	10–13	8–9	15–18
Moderate	14–20	10–14	19–25
Severe	21–27	15–19	26–33
Extremely Severe	≥ 28	≥ 20	≥ 34

2.2.2. Health-promoting lifestyle profile II (HPLP-II)

The HPLP-II developed by Walter et al was widely used to evaluate an individual’s health promoting lifestyle. The Chinese version of HPLP-II was used in this study, which has high reliability and validity (Wang et al., 2022). The scale contains 52 items across six behavioral domains: Nutrition (9 items), Interpersonal Relations (9 items), Health Responsibility (9 items), Physical Activity (9 items), Stress Management (8 items), and Spiritual Growth (8 items). All items are rated on a four-point Likert scale, with responses ranging from 4 for “always” to 1 for “never,” resulting in a total score between 52 and 208. Higher scores indicated a more favorable health-promoting lifestyle. According to the previous study, HPLP-II is divided into three levels: low (52–104), middle (105–156) and high (157–208) (Zhou et al., 2022). The Cronbach’s alpha values in this study ranged from 0.951 to 0.957 for the subscales and 0.939 for the entire scale, signifying robust internal consistency.

2.2.3. Relevant covariates

Guided by previous research, a self-report questionnaire was used to evaluate individuals' sociodemographic characteristics and lifestyles (Fawzy and Hamed, 2017). Collected socio-demographic variables included age, gender, height, weight, major, place of residence, parents' educational level, primary caregiver, number of siblings, and self-rated health status. Lifestyle variables included tobacco consumption, alcohol consumption, stimulating drinks (e.g., tea, coffee, cola), and sleep duration. The body mass index (BMI) was computed as weight divided by the square of height, expressed as $BMI = \text{weight (in kg)}/\text{height}^2 \text{ (in m}^2\text{)}$. According to the Chinese BMI classification (Pan et al., 2021), subjects with $BMI < 18.5$, $18.5-23.9$ and $\geq 24 \text{ kg/m}^2$ were defined as underweight, normal, and overweight/obese, respectively.

2.3. Statistical analysis

All data were processed using SPSS 23.0 (SPSS Inc., Chicago, IL, USA). Categorical variables in participants' characteristics were represented as frequency (percentage), with gender differences analyzed using the chi-square test. The chi-square test was also employed to assess gender and major differences in the prevalence of psychological disorders. Concerning the level of HPLP, continuous variables were expressed as the median (upper quartile, lower quartile). Continuous variables related to HPLP were expressed as the median (upper quartile, lower quartile), and differences between participants with and without psychological disorders were investigated using the Mann-Whitney test. Furthermore, multiple logistic regression analysis was performed to explore the relationship between relative HPLP and psychological disorders.

3. Results

3.1. Participants' characteristics

Among the surveyed 17,636 college students, there were 7990 (45.3%) males and 9646 (54.7%) females. Compared with males, females tended to be younger, major in humanities and social sciences, have a normal BMI, and exhibit sub-health (P -value < 0.001). According to family background, females experienced a more harmonious family atmosphere, including parents with a senior high school education level, being raised by parents, and having two or more siblings (P -value < 0.05). Besides, females smoked and consumed alcohol less than males but had more unhealthy sleep duration (P -value < 0.001). In addition, there were no significant gender differences in the place of residence and consumption of stimulating drinks (**Table 2**).

Table 2. Frequently distribution of college student's sociodemographic characteristics.

Variables	Total (n = 17,636)	Male (n = 7990)	Female (n = 9646)	P-value
Gender				
Male	7990 (45.3%)	–	–	–
Female	9646 (54.7%)	–	–	–

Table 2. (Continued).

Variables	Total (n = 17,636)	Male (n = 7990)	Female (n = 9646)	P-value
Age (years)				
< 21	9709 (55.1%)	4152 (52.0%)	5557 (57.6%)	< 0.001
≥ 21	7927 (44.9%)	3838 (48.0%)	4089 (42.4%)	
BMI (kg/m²)				
Underweight	2699 (16.8%)	1063 (13.3%)	1903 (19.7%)	< 0.001
Normal	10,744 (60.9%)	4509 (56.4%)	6235 (64.6%)	
Overweight/obese	3926 (22.3%)	2418 (30.3%)	1508 (15.6%)	
Major				
Science and Engineering	12,476 (70.7%)	6789 (85.0%)	5678 (59.0%)	< 0.001
Humanities and Social Sciences	5160 (29.3%)	1201 (15.0%)	3959 (41.0%)	
Health status				
Health	12,879 (73.0%)	5955 (74.5%)	6924 (71.8%)	< 0.001
Subhealth	4718 (26.8%)	2014 (25.2%)	2704 (28.0%)	
Unhealth	39 (0.2%)	21 (0.3%)	18 (0.2%)	
Place of Residence				
Urban	7991 (45.3%)	3573 (44.7%)	4418 (45.8%)	0.150
Rural	9645 (54.7%)	4417 (55.3%)	5228 (54.2%)	
Father's educational level				
Primary school or below	2155 (12.2%)	1036 (13.0%)	1119 (11.6%)	0.023
Junior high school	6256 (35.5%)	2806 (35.1%)	3450 (35.8%)	
Senior high school	5681 (32.2%)	2522 (31.5%)	3159 (32.7%)	
Junior college and above	3544 (20.1%)	1626 (20.4%)	1918 (19.9%)	
Mother's educational level				
Primary school or below	3484 (19.7%)	1685 (21.1%)	1799 (18.7%)	< 0.001
Junior high school	5990 (34.0%)	2665 (33.4%)	3325 (34.5%)	
Senior high school	5382 (30.5%)	2369 (29.6%)	3013 (31.2%)	
Junior college and above	2780 (15.8%)	1271 (15.9%)	1509 (15.6%)	
Primary caregiver				
Parents	15,320 (86.9%)	6953 (87.0%)	8367 (86.7%)	0.008
Father or Mother	1689 (9.5%)	721 (9.1%)	968 (10.1%)	
Grandparents	537 (3.1%)	274 (3.4%)	263 (2.7%)	
Others	90 (0.5%)	42 (0.5%)	48 (0.5%)	
Number of siblings				
None	5706 (32.4%)	2711 (33.9%)	2995 (31.0%)	< 0.001
One	9842 (55.8%)	4592 (57.7%)	5250 (52.4%)	
Two or more	2088 (11.8%)	687 (8.6%)	1401 (14.5%)	
Tobacco consumption				
Smoker	232 (1.3%)	207 (2.6%)	25 (0.3%)	< 0.001
Non-smoker	17,404 (98.7%)	7783 (97.4%)	9621 (99.7%)	

Table 2. (Continued).

Variables	Total (n = 17,636)	Male (n = 7990)	Female (n = 9646)	P-value
Alcohol consumption				
Drinker	293 (1.7%)	226 (2.8%)	67 (0.7%)	< 0.001
Non-drinker	17,343 (98.3)	7764 (97.2%)	9579 (99.3%)	
Stimulating drinks				
Yes	2333 (13.2%)	1041 (13.0%)	1292 (13.4%)	0.476
No	15,303 (86.8%)	6949 (87.0%)	8354 (86.6%)	
Sleep duration				
< 7 h and > 8 h	8305 (47.1%)	3456 (43.3%)	4849 (50.3%)	< 0.001
7–8 h	9331 (52.9%)	4534 (56.7%)	4797 (49.7%)	

Note. BMI: body mass index; P-value: males versus females.

3.2. Statistical results for psychological disorders

Among the college students surveyed, 7.2%, 15.4% and 4.0% respectively had mild to extremely severe symptoms of depression, anxiety, and stress. Moreover, we observed a significantly higher prevalence of anxiety and stress in females compared to males (P -value < 0.05). However, there was no significant difference in the prevalence of stress between genders (7.3% of males and 7.2% of females). In terms of academic disciplines, our study revealed that college students majoring in humanities and social sciences experienced more severe psychological disorders than those majoring in science and engineering (P -value < 0.001) (Table 3).

Table 3. The prevalence and severity of psychological disorders among Chinese college students of different genders and majors.

DASS-21	Categories	Total (n = 17,636)	Male (n = 7990)	Female (n = 9646)	Science and Engineering (n = 12,476)	Humanities and Social Science (n = 5160)
Depression	Normal	92.8%	92.7%	92.8%	93.4%	91.1%
	Symptomatic	7.2%	7.3%	7.2%	6.6%	8.9% ⁺⁺
	Mild	2.9%	3.0%	2.9%	2.6%	3.7%
	Moderate	3.3%	3.2%	3.4%	2.9%	4.3%
	Severe	0.5%	0.5%	0.5%	0.5%	0.5%
	Extremely Severe	0.5%	0.6%	0.4%	0.6%	0.4%
Anxiety	Normal	84.6%	86.8%	82.8%	86.6%	79.8%
	Symptomatic	15.4%	13.2%	17.2% ^{**}	13.4%	19.2% ⁺⁺
	Mild	3.9%	3.2%	4.5%	3.6%	4.5%
	Moderate	7.5%	6.4%	8.4%	6.3%	10.5%
	Severe	1.9%	1.6%	2.2%	1.7%	2.6%
	Extremely Severe	2.1%	2.0%	2.1%	1.8%	2.6%

Table 3. (Continued).

DASS-21	Categories	Total (n = 1,7636)	Male (n = 7990)	Female (n = 9646)	Science and Engineering (n = 12,476)	Humanities and Social Science (n = 5160)
Stress	Normal	96%	96.4%	95.7%	96.5%	94.8%
	Symptomatic	4.0%	3.6%	4.3%*	3.5%	5.2% ⁺⁺
	Mild	1.9%	1.6%	2.2%	1.7%	2.6%
	Moderate	1.2%	1.1%	1.4%	1.0%	1.9%
	Severe	0.8%	0.9%	0.6%	0.8%	0.6%
	Extremely Severe	0.1%	0.0%	0.1%	0.0%	0.1%

Note: Significant gender differences: * P -value < 0.05, ** P -value < 0.001; significant major differences: ⁺⁺ P -value < 0.001.

Based on the results obtained from the DASS-21 scale, 83.8% of college students reported had none of psychological disorders; 9.6% presented two or more psychological disorders, with 6.4% experiencing symptoms of depression, anxiety, and stress simultaneously. When considering different genders, females were more likely to experience anxiety and stress simultaneously than males (P -value < 0.05). Across different majors, undergraduates majoring in humanities and social sciences exhibited significantly higher percentage of two or more psychological disorders than those majoring in science and engineering (P -value < 0.001). Moreover, an interesting finding emerged that college students experiencing both depression and stress consistently manifested symptoms of anxiety (**Figure. 1**)

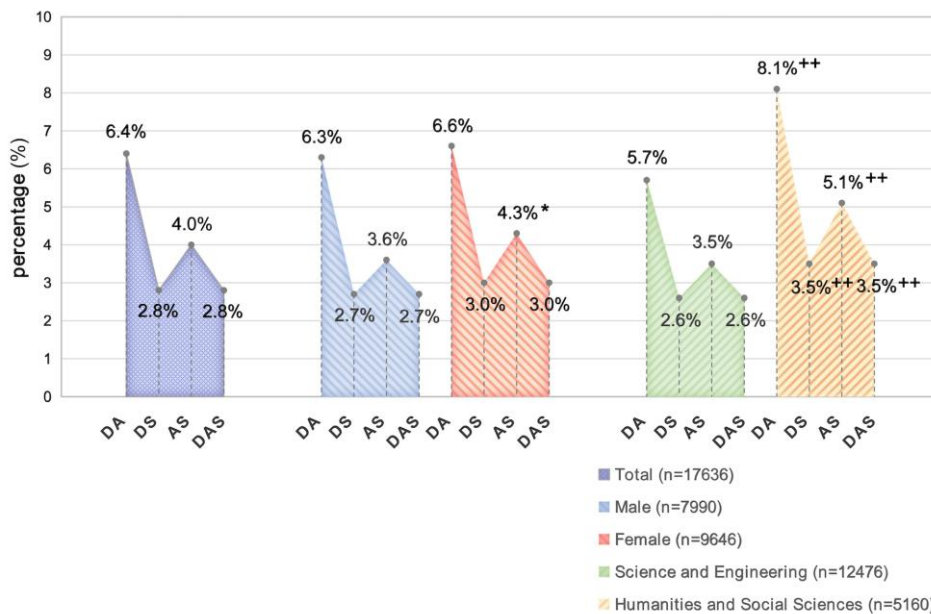


Figure 1. The coexistence rate of psychological disorders among Chinese college students of different genders and majors.

Note: Significant gender differences: * P -value < 0.05; significant major differences: ⁺⁺ P -value < 0.001.

3.3. Association between psychological disorders and HPLP

The scores across the six dimensions of HPLP ranged as follows: nutrition 9–36 points, interpersonal relations 9–36 points, health responsibility 9–36 points, spiritual growth 8–32 points, physical activity 8–32 points, and stress management 9–36 points. **Figure 2** illustrates that college students without psychological disorders significantly outscored their counterparts with psychological disorders across all six dimensions of HPLP (All P -value < 0.001). Among these dimensions, interpersonal relations score the highest, while health responsibility and physical activity scores were the lowest.

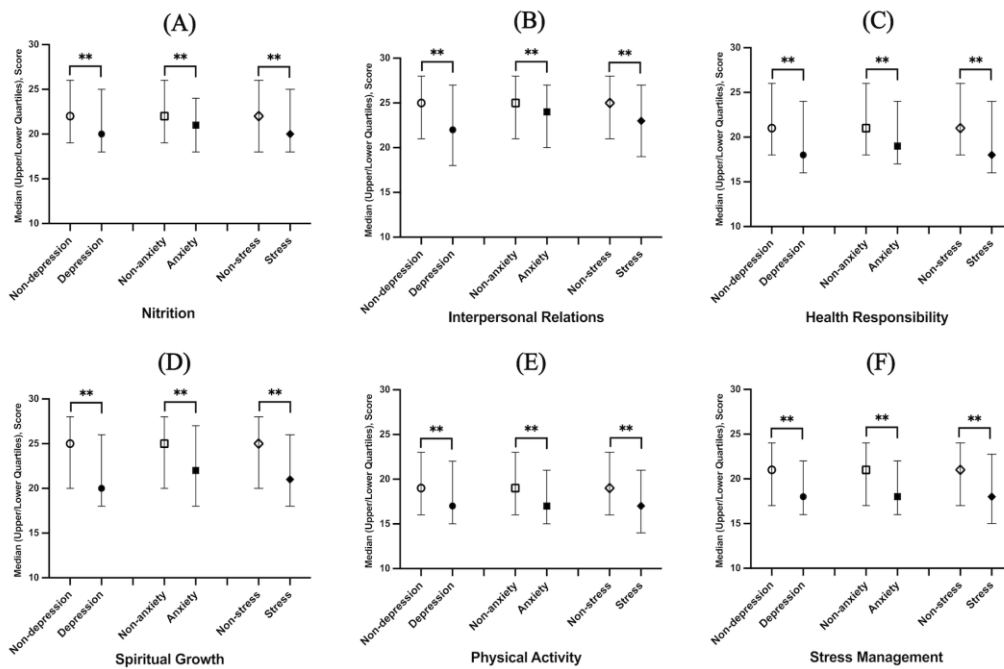


Figure 2. Score of HPLP-II subscales among Chinese college students.

Note: ** P -value < 0.001.

Table 4 demonstrates a significant inverse correlation between changes in HPLP levels and the incidence risk of depression, anxiety, and stress. In the crude model, the odds ratios (ORs) and 95% CI of depression across categories of HPLP were 1.000 (reference) for low HPLP, 0.363 (0.320, 0.412) for middle HPLP, and 0.235 (0.190, 0.290) for high HPLP (P -value < 0.001); the ORs and 95% CI of anxiety across categories of HPLP were 1.000 (reference) for low HPLP, 0.629 (0.570, 0.695) for middle HPLP, and 0.333 (0.385, 0.389) for high HPLP (P -value < 0.001); the ORs and 95% CI of stress across categories of HPLP were 1.000 (reference) for low HPLP, 0.437 (0.368, 0.519) for middle HPLP, and 0.479 (0.376, 0.609) for high HPLP (P -value < 0.001). After adjusting for potential confounders, the multivariable-adjusted ORs and 95% CI of depression for the categories of HPLP were 1.000 (reference) for low HPLP, 0.454 (0.389, 0.518) for middle HPLP, 0.361 (0.289, 0.450) for high HPLP (P -value < 0.001); the multivariable-adjusted ORs and 95% CI of anxiety for the categories of HPLP was 1.000 (reference) for low HPLP, 0.757 (0.681, 0.841) for middle HPLP, 0.480 (0.408, 0.565) for high HPLP (P -value < 0.001); the multivariable-adjusted ORs and 95% CI of stress for the categories of HPLP was 1.000

(reference) for low level, 0.575 (0.481, 0.688) for middle HPLP, 0.821 (0.636, 1.060) for high HPLP (P -value < 0.001).

Table 4. Adjusted odds ratios (95% confidence interval) of associations between psychological disorders and HPLP among Chinese college students.

	Low HPLP (52–104)	Middle HPLP (105–156)	High HPLP (157–208)	P -value
Depression				
Case/total	454/3019	709/1,1735	115/2882	
Crude model	1.000 (reference)	0.363 (0.320–0.412)	0.235 (0.190–0.290)	< 0.001
Model 1	1.000 (reference)	0.440 (0.386–0.502)	0.344 (0.276–0.429)	< 0.001
Model 2	1.000 (reference)	0.454 (0.398–0.518)	0.361 (0.289–0.450)	< 0.001
Anxiety				
Case/total	672	1792	251	
Crude	1.000 (reference)	0.629 (0.570–0.695)	0.333 (0.285–0.289)	< 0.001
Model 1	1.000 (reference)	0.732 (0.659–0.812)	0.456 (0.387–0.536)	< 0.001
Model 2	1.000 (reference)	0.757 (0.681–0.841)	0.480 (0.408–0.565)	< 0.001
Stress				
Case	217	384	103	
Crude	1.000 (reference)	0.437 (0.368–0.519)	0.479 (0.376–0.609)	< 0.001
Model 1	1.000 (reference)	0.550 (0.460–0.657)	0.763 (0.591–0.983)	< 0.001
Model 2	1.000 (reference)	0.575 (0.481–0.688)	0.821 (0.636–1.060)	< 0.001

Note: Model 1 adjusted for socio-demographic variables [age (continuous variable), BMI (underweight, normal, or overweight/obese), major (Science and Engineering or Humanities and Social Sciences), and health status (health, subhealth, or unhealth), place of residence (urban or rural), father's educational level (primary school or below, junior high school, senior high school, or junior college and above), mother's educational level (primary school or below, junior high school, senior high school, or junior college and above), primary caregiver (parents, father or mother, grandparents, or others), and number of siblings (none, one, or two or more)]. Model 2 adjusted for socio-demographic variables and lifestyles [tobacco consumption (smoker or non-smoker), alcohol consumption (drinker or non-drinker), stimulating drinks (yes or no), and sleep duration (< 7 h and > 8 h or 7–8 h)].

4. Discussion

4.1. Psychological disorders among Chinese college students

Our study found that the prevalence of psychological stress (4.0%), depression (7.2%) and anxiety (15.4%) in Chinese college students was low. By using a larger sample size than previous studies, our results provide a comprehensive view of mental health problems and are consistent with existing studies using the DASS-21 scale (Yu et al., 2022). Specifically, anxiety is the most common psychological disorder, while stress is the least common. The low prevalence rate of our study was compared with that reported in small-scale studies. For example, Zeng et al. found that the prevalence of depression (28.7%) and anxiety (41.7%) were significantly higher among higher vocational nursing students (Zeng et al., 2019). Similarly, Liang et al. reported that 25.4% of college students had anxiety symptoms and 32.8% had depression symptoms (Liang et al., 2023). In contrast, our findings contribute to a broader understanding of mental health trends, highlighting the potential impact of sample size and regional differences on reported prevalence. It is worth noting that some large-scale studies

also reported lower depression rates (10.5% and 7.8%) and anxiety rates (14.1% and 17.8%) (Shen et al., 2020; Tao et al., 2023), emphasizing the consistent trend of lower incidence in large-scale studies.

Furthermore, our findings indicate that female undergraduates and those in the science and engineering disciplines are more prone to experiencing complex psychological problems. Anxiety, depression, and stress are commonly encountered in young age, and are more common in females than in males (Farrer et al., 2016). While males are more prone to alcohol consumption and smoking, there is a stronger association between substance use behaviors and psychological disorders in females (Breslau, 1995). Our research revealed that the incidence of female psychological disorders is higher, which may be attributed to the fact that females experience greater competitive pressure, are more inclined to pursue higher academic achievements and better interpersonal relationships, and are more prone to exaggerate their negative emotions (Paykel, 1991). Furthermore, females exhibit a greater tendency to provide more stringent responses on self-report scales compared to males (Ritvo et al., 2008). In general, no study reporting gender differences has provided definitive reasons explaining why female participants exhibit significant psychological disorders compared to males. However, the most plausible explanation for gender differences is multifactorial, encompassing a combination of neurophysiological, socio-cultural, or a composite of individual variable factors.

Research indicates that students in the humanities and social sciences are more prone to psychological disorders compared to their peers in the sciences and engineering. This phenomenon may be linked to higher levels of self-awareness and emotional insight among humanities students, coupled with relatively poorer emotional regulation and lower social adaptability (Li et al., 2022; Yang, 2016). Furthermore, gender composition plays a critical role; the proportion of females in humanities and social sciences is significantly higher than in science and engineering fields. This gender disparity introduces unique pressures, including societal expectations, competitive stress, and concerns about career prospects, which can adversely affect psychological well-being (Chan and Cheung, 2022).

We observed a distinctive finding that the simultaneous occurrence of stress and depression is consistently accompanied by anxiety. Physiologically, cortisol serves as the primary anti-stress hormone; however, prolonged overproduction of cortisol may heighten susceptibility and be associated with the concurrent manifestation of depression and anxiety (McLaughlin et al., 2022; Zorn et al., 2017). Additionally, depression, stress, and anxiety often correlate with dysregulated neurotransmitters, such as serotonin, dopamine, and norepinephrine. These neurotransmitters play crucial roles in emotional regulation within the brain (Ruhé et al., 2007). When an individual experiences depression or stress, the levels of neurotransmitters may be altered, which may potentially influence the onset of anxiety. Therefore, the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis is a key biological mechanism leading to the simultaneous occurrence of stress, depression, and anxiety (Young et al., 2004). This aligns with the notion that “if you have one symptom, you may also have another,” which emphasizes the interconnectedness of psychological well-being conditions (Marshall, 2020).

4.2. Association between psychological disorders and HPLP

Multiple logistic analysis established that higher levels of HPLP are independently associated with lower risk of depression, anxiety, and stress after adjusting for age, gender, BMI, major, health status, place of residence, father's educational level, mother's educational level, primary caregiver, number of siblings, tobacco consumption, alcohol consumption, stimulating drinks, and sleep duration.

The HPLP delineates a comprehensive framework encompassing six discrete behavioral domains, namely interpersonal relations, nutrition, health responsibility, physical activity, stress management, and spiritual growth (Wang et al., 2022). Interpersonal relationships play a pivotal role in psychological well-being outcomes. Social support and a sense of belonging, which can be fostered through positive relationships, have been identified as protective factors against depression and anxiety (Yuan et al., 2022). Constituting one facet of the HPLP, the nutritional domain underscores the influence of a balanced diet on neurotransmitter synthesis, cognitive function, and psychological health (Corfe and Owen, 2017). A systematic review of cohort studies reported that the consumption of nutrients such as folate, monounsaturated fatty acids, omega-3 fatty acids, foods such as olive fish and oil, and a diet rich in fruits, vegetables, legumes, and nuts are variables negatively correlated with the risk of depression in adults (Sanhueza et al., 2013). Furthermore, health responsibility, including health knowledge, regular physical examinations, and obtaining timely medical treatment, advocates for proactive health management. This proactive approach has the potential to mitigate stressors and facilitate timely interventions to prevent psychological distress (Jensen et al., 2006). Physical activity, a cornerstone of the HPLP, analogous to psychotherapy in its efficacy in reducing the severity of depression (Craft and Landers, 1998), offers potential protection for psychological health. Consistent with previous research findings, advocating for physical activity can benefit college students' overall psychological well-being (Grasdalsmoen et al., 2020). In summary, this multidimensional pattern underscores the self-initiated perceptions and actions that contribute substantially to individual well-being, self-actualization, and fulfillment.

Among the six subscales of the HPLP, college students scored highest on the interpersonal relations subscale and lowest on the physical activity and health responsibility subscales. Health responsibility scores among university students are consistently low across different countries. For example, Mexican students present lower scores in both health responsibility and physical activity (Núñez-Rocha et al., 2020). Turkish student-athletes also report the lowest scores in health responsibility and nutrition (Çelik and Haney, 2023), and similar findings have been observed among Japanese university students (Wei et al., 2012). Health responsibility involves being attentive and accountable for one's health, seeking timely professional assistance, and engaging in health education (Jensen et al., 2006). Only by recognizing the importance of health responsibility and promoting a healthy lifestyle can students actively take measures to cultivate a sustained positive daily routine, including increasing physical activity.

5. Conclusion

In conclusion, our study found that the prevalence of psychological stress (4.0%), depression (7.2%) and anxiety (15.4%) among Chinese college students was low, and female students and students majoring in Humanities and Social Sciences showed higher levels of psychological disorders. In addition, our findings also emphasize that higher HPLP scores, especially in interpersonal relationships and nutrition, are associated with lower risk of mental disorders.

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