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ORIGINAL RESEARCH

The Relationship Between Mental Health Literacy, Overall Adaptation and Mental Health of University Freshers

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Background: Entering university is a big change in life. It can cause a lot of stress for new students. Stress can affect their mental health in a negative way. Mental health literacy is the knowledge and skills to deal with mental health issues. It can help new students cope better with stress and improve their mental health.

Objective: To investigate the status of mental health literacy, overall adaptation, and mental health of university freshers, and to explore the influence of mental health literacy on the overall adaptation and mental health, as well as the mediating role of overall adaptation.

Methods: The undergraduate freshers of 2022 from a comprehensive university in Henan Province were selected as the research participants using a cluster sampling method and were investigated by the general information questionnaire, mental health literacy scale (MHLS), the university student overall adaptation questionnaire (CSOAQ) and university personality inventory (UPI).

Results: (1) The detection rate of mental health problems among freshers was 22.39%, and the mental health literacy (112.26 ± 9.66), overall adaptation (3.93 ± 0.93), mental health (10.90 ± 10.51) of freshers had significant differences in demographic variables. (2) Mental health literacy was significantly positively correlated with overall adaptation and mental health, and overall adaptation was significantly positively correlated with mental health. (3) Overall adaptation plays a mediating role in the impact of mental health literacy on mental health. (4) Gender plays a moderating role in the effects of overall adaptation on mental health.

Conclusion: The mental health literacy of university freshers could not only directly predict their mental health but also indirectly affect their mental health through overall adaptation, which is more significant among women.

Keywords: university freshers, mental health literacy, overall adaptation, mental health, gender

Introduction

University freshers refer to students who have just become Grade One undergraduate students. Entering university marks a critical phase of adolescent physical and mental development, and it is a typical social stress event. If university freshers fail to cope effectively with this stressful event, it may lead to various mental health (MH) problems.[1,2] Research indicates that around 12% of Chinese university freshers face serious psychological problems, and the number of freshers experiencing psychological issues has been increasing over the years.[3,4] Moreover, the COVID-19 pandemic has significantly impacted the learning and lifestyle of teenagers, leading to MH problems such as anxiety, emotional imbalance, maladaptive behavior, obsession, depression, and an increased inclination towards suicide.[5–7] University freshers constitute a unique group of adolescents who have recently completed the university entrance examination and are adapting to the changes in identity, studies, and psychology as they transition to university life. They may experience more severe MH problems, and their MH level is closely linked to their academic development, interpersonal relationships, and lifetime employment, which could have

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a long-term influence on their future development.[8] Therefore, the present study aims to investigate the MH of university freshers and explore ways to improve their MH level.

The concept of Mental Health Literacy (MHL) has been derived from the notion of health literacy and pertains to the knowledge and beliefs about mental illness that are helpful in recognizing, managing, or preventing mental illnesses.[9] O'Connor et al[10] proposed a three-dimensional model of MHL: Recognition, Knowledge, and Attitude. Recognition refers to an individual's ability to correctly identify different mental disorders; knowledge refers to an individual's knowledge of the causes, risks, and treatments of mental illnesses; and attitude refers to an attitude that can help an individual enhance his or her ability to identify mental illnesses and improve his or her professional help-seeking behaviour. High levels of MHL can help individuals enhance their ability to identify, cope with, and prevent common mental illnesses, improve their sense of professional help and health beliefs when faced with psychological distress, and play an important role in reducing the stigma of mental illnesses and improving the mental health of individuals and the public.[11–13] While studies reveal that about 30% of Chinese university students experience various psychological problems, with about 10% of them experiencing serious mental illness,[14] there exists a low rate of willingness to seek professional help from teachers or institutions due to high stigma towards mental illness, lack of knowledge.[14,15] Given the importance of MHL in improving mental health, it is crucial to improve MHL, as it is a vital psychological resource closely associated with an individual's mental health. University students lacking MHL have difficulties accessing sufficient mental health resources, coping with stress or emotional changes, and are more susceptible to psychological problems such as depression, anxiety, and self-harm or suicidal thoughts and behaviors, which can have serious physical and mental health consequences.[13] Therefore, the second aim of this study is to explore the relationship between the MHL level of university freshers and their mental health.

Adaptation refers to the dynamic balance of harmony and stability with the surrounding environment through continuous learning and adjustment of oneself or changes in the environment.[16] The level of adaptation reflects an individual's survival and developmental status, is an important indicator of an individual's MH level, and is closely related to an individual's MH status. Nowadays, the adaptability of university students has gradually become a new issue,[17] and has become an important criterion and feature for measuring the MH of university students.[18] The inability to effectively deal with the relationship with the surrounding reality environment is an important cause of adaptive disorders. As a special group, university freshers are in a transitional phase from high school to university. Due to changes in the surrounding environment, university freshers often face changes in identity, psychology, learning methods, and social groups, and are prone to show maladaptation in various aspects such as academic performance, life, interpersonal relationship, leading to adaptive disorders, and even negative emotions such as depression, loneliness, and anxiety, etc.,[19] and even extreme thoughts and behaviors such as suicide.[20] These negative emotions and psychological problems can have a great damaging effect on the physical and mental health, as well as the academic development of university students, seriously hindering their healthy development. Previous studies have shown that there is a close relationship between university students' adaptation level and MH. The higher the level of adaptation, the better the mental health.[21–23] In addition, MHL, as an important factor in promoting MH, can reduce negative effects and improve the MH of individuals by reducing psychological distress such as post-traumatic stress symptoms and anxiety when facing stress and stressful events.[24] University freshers who lack MHL may be more likely to develop negative emotions such as depression and loneliness,[14] and thus develop various psychological problems such as adjustment disorders, as they do not have sufficient psychological resources to cope with the various stresses in the new environment and cannot effectively deal with their adaptation to the new environment. MHL can also positively influence students' psychological resilience and positive coping strategies.[25] University freshers with good MHL can adopt more proactive coping strategies when facing the life event of entering University. The MHL of university freshers may have a positive impact on their overall adaptation, but there is still limited empirical research on this topic. Therefore, the third objective of this study is to investigate the overall adaptation level of university freshers, pay attention to the relationship between MHL, overall adaptation, and MH of university freshers, and examine the mediating effect of overall adaptation on MHL and MH.

In summary, the present study aims to investigate the MH of university freshers. Firstly, the study intends to examine the current MH status of university freshers and provide appropriate interventions. Secondly, the study aims to explore the level of MHL among university freshers and investigate its relationship with their MH. Finally, the study introduce overall adaptation as a mediating variable to investigate the role of overall adaptation in the relationship between MHL

and MH. This study employs a quantitative research method to provide universities with targeted MH education, enhance the construction of student psychological service system, promote MHL and overall adaptation level of university freshers, and ultimately improve their mental health status in university.

Methods

Sample

Sample Estimation: According to the sample size calculation method for cross-sectional study: $n = \left(\frac{z_{1-\alpha/2}}{\delta}\right)^2 \times p \times (1-p)$ Based on reference to existing studies,[26,27] the tolerance error δ was set at 0.02, the statistically significant level α was set as 0.05, and p was set as 0.5. The minimum sample size was calculated according to the formula, n=2401, and the final sample size for this study should be 3002 considering a 20% loss.

The data for this study were collected through clustering sampling. Participants were selected from the class of 2022 undergraduate freshers at a comprehensive university in Henan Province, China. Questionnaires were administered to all freshers at the end of October 2022, two months after they had enrolled. A total of 8014 questionnaires were received, and those who did not respond halfheartedly or provided invalid responses to the UPI questionnaire were excluded. Ultimately, 6583 questionnaires were retained for statistical analysis, resulting in an effective rate of 82.14%. The participants came from 32 schools of the university, covering 12 disciplines. The sample consisted of 2842 males (43.17%), 3741 females (56.83%), 3109 (47.23%) participants from urban areas, and 3474 (52.77%) from rural areas. The average age of participants was 18.06 (SD = 1.30) years.

Measures

General Information

To gather general information about the university freshers, a self-administered questionnaire was utilized. The questionnaire covered various demographic information, such as gender, major, age, and place of origin. In addition, individual MH background factors were also included, such as whether or not they have taken MH education courses, attended MH education lectures, read psychology-related books, and have relatives or friends with a psychological background.

Mental Health Literacy

The Mental Health Literacy Scale (MHLS) was utilized to assess the mental health literacy of university freshers. The original scale was developed by O'Connor and Casey[28] based on the three-component structure of MHL [identification, knowledge, and attitude]. Chen et al[9] adapted and validated this scale and demonstrated its good reliability in the Chinese culture. However, due to the difference of language and culture, the Chinese version of MHLS has six dimensions: the ability to recognize mental illness (eight items], knowledge of the risk and causes of illness (two items), knowledge of seeking professional help (three items), knowledge of self-help (two items), knowledge of seeking mental health information (four items), and attitudes towards promoting awareness of mental illness or help-seeking behavior (16 items). Respondents rated items 1–15 on a 4-point Likert scale, ranging from 1 (very unlikely true or very unhelpful) to 4 (very likely true or very helpful) (eg, "To what extent do you believe personality disorders are a form of mental illness?"), while items 16–35 were rated on a 5-point Likert scale, ranging from 1 (strongly disagree or unwilling) to 5 (strongly agree or willing) (eg, "How willing are you to live next door to someone with a mental illness?"). The scale includes 12 reverse-scored items, and the total score ranges from 35 to 160, with a higher score indicating better MHL. The Cronbach's alpha for the MHLS in this study was 0.79.

Overall Adaptation

The University Student Overall Adaptation Questionnaire (USOAQ), developed by Dang et al[29] was used to measure the overall adaptation level of university freshers. The scale comprises 21 items and assesses study adaptation (8 items, eg, adapting to the academic demands of university], interpersonal adaptation (7 items, eg, adapting to interactions with university students of the opposite sex), and campus life adaptation (6 items, eg, adapting to food at school). Participants rate the items on a Likert-7 scale ranging from 0 (No Fit) to 6 (Full Fit), indicating how well they fit in. The maximum

score on the scale is 126 points, and a higher score indicates a greater degree of adjustment in university. The Cronbach's alpha coefficient for the CSOAQ in this study was 0.96.

Mental Health

The University Personality Inventory (UPI) was utilized to measure the mental health (MH) of university freshers. The UPI was originally compiled by a group of psychological counselors and psychiatrists in Japan, and the Chinese version was translated and revised by Chinese scholars Fan Fumin and Wang Jianzhong.[30] It comprises 64 items, including 4 pseudo-questions, 4 auxiliary questions, and 56 general symptom items, which are scored on a "yes/no" scale, with 1 representing "yes" and 0 representing "no". The maximum score is 56, and a lower score indicates a higher level of MH in university freshers. The four key questions on UPI - item 8 (feeling that your past and family are unfortunate), item 16 (frequent insomnia), item 25 (wanting to commit suicide), and item 26 (not interested in anything) - are important indicators for assessing MH. In addition, by combining the total score of the UPI and the selection of auxiliary items, subjects can be categorized into three categories according to Zhou et al[31] [1] total score $\geq$ 25 or affirmative choice on item 25 or affirmative choice on at least two of the auxiliary questions belong to I freshers (possible serious psychological problems); (2) 20 $\leq$ total score < 25 or affirmative choice on at least one of the auxiliary questions or one of item 8, 16, 26 making the affirmative choice belong to II freshers (possible general psychological problems); (3) The rest which is not in I and II are classified as III freshers (psychological well-being). The Cronbach's alpha coefficient of UPI in this study was 0.93.

Data Analysis

The collected data were analyzed using IBM SPSS 25.0. Categorical variables were summarized using numbers or percentages, while continuous variables with a normal distribution were presented as means and standard deviations (means ± SD). Independent-sample t-tests were performed to compare the scores of MHL, overall adaptation, and MH among university freshers based on demographic variables. Correlation analysis and regression analysis were conducted to investigate the relationships between variables. The mediation effect of overall adaptation was examined through regression and bootstrap analyses using the PROCESS 3.4 macro.

Results

Common Method Bias

To account for common method bias, we conducted the Harman single-factor test[32] given that all questionnaires used were self-assessment scales. The exploratory factor analysis results showed that the number of factors without rotation was greater than one, and the variance interpretation percentage of the first principal component was 17.65%, which is less than the threshold of 40%. This suggests that common method bias had minimal impact on the overall results of our study.[33]

Analysis of the Detection of MH Problems

Firstly, the score and detection of UPI were examined. The range of UPI scores for university freshers was from 0 to 56, with an average score of 10.90 ± 10.51. According to the UPI classification criteria, 1474 students were categorized as I, indicating possible serious MH problems (22.39%); 1717 students were categorized as II, indicating possible general MH problems (26.08%); and 3392 students were categorized as III, indicating no MH problems (51.53%). The distribution of freshers in each category based on gender is presented in Table 1.

Subsequently, the selection of the four key items in UPI was checked. In this study, 600 freshers (9.11%) reported feeling that their past and family were unfortunate (item 8); 645 freshers (9.80%) reported frequent insomnia (item 16); 173 freshers (2.63%) answered "yes" to item 25, indicating a desire to commit suicide; and 472 freshers reported having no interest in anything (item 26), which accounted for 7.17% of the total sample.

Table 1 Detection of MH Problems Among University Freshers

Category	All Samples (n, %)	Male (n, %)	Female (n, %)
I	1474 (22.39%)	579 (39.28%)	895 (60.72%)
II	1717 (26.08%)	744 (43.33%)	973 (56.67%)
III	3392 (51.53%)	1519 (44.78%)	1873 (55.22%)
Total	6583 (100.00%)	2842 (43.17%)	3741 (56.83%)

Analysis of the Differences in Demographic Characteristics and Individual MH Background Factors

The independent-sample *t*-test for MHL, overall adaptation, and UPI total score of university freshers based on demographic characteristics and individual MH background factors are summarized in Table 2.

Descriptive Statistics and Correlation Analysis

The mean scores for MHL, overall adaptation, and UPI total score of university freshers were 112.26 ± 9.66, 3.93 ± 0.93, and 10.90 ± 10.51, respectively. Pearson correlation analysis was conducted to examine the relationships among MHL, overall adaptation, and UPI total score. As shown in Table 3, MHL was significantly negatively correlated with UPI total score ($r = -0.08$, $p < 0.001$), and significantly positively correlated with the level of overall adaptation ($r = 0.27$, $p < 0.001$). Furthermore, the overall adaptation level was significantly negatively correlated with UPI total score ($r = -0.45$, $p < 0.001$).

Regression Analysis

Linear regression analysis was conducted to examine the predictive effect of MHL to overall adaptation and UPI total score. Based on the data in Table 4, MHL was found to significantly predict UPI total score even after controlling for gender, place of origin, and individual MH background factors (whether or not to have studied MH education courses, whether or not to have attended MH education lectures, whether or not to have read psychology-related books, whether or not to have psychological background relatives and friends) (M 4, $\beta = -0.08$, $p < 0.001$), while positively predicting

Table 2 Analysis of the Differences in Demographic Characteristics and Individual MH Background Factors

Items			MHL	OA	UPI
Gender	Male (*n*=2842)	*M*±*SD*	109.66±9.47	3.92±0.95	10.06±10.36
	Female (*n*=3741)	*M*±*SD*	114.23±9.33	3.94±0.91	11.54±10.57
		t	−19.60***	−0.63	−5.69***
Origin	Urban area (*n*=3109)	*M*±*SD*	112.61±10.07	4.06±0.96	9.93±10.18
	Rural area (*n*=3474)	*M*±*SD*	111.94±9.26	3.81±0.88	11.77±10.72
		t	2.81**	10.59***	−7.17***
Whether or not to have studied MH education courses	Yes (*n*=4366)	*M*±*SD*	113.16±9.67	4.02±0.92	9.81±9.89
	No (*n*=2217)	*M*±*SD*	110.48±9.39	3.74±0.92	13.05±11.33
		t	10.74***	11.76***	−11.41***
Whether or not to have attended MH education lectures	Yes (*n*=4190)	*M*±*SD*	113.04±9.76	4.04±0.92	9.69±9.83
	No (*n*=2393)	*M*±*SD*	110.89±9.33	3.74±0.90	13.03±11.29
		t	8.86***	12.54***	−12.10***
Whether or not to have read psychology-related books	Yes (*n*=3264)	*M*±*SD*	113.47±10.01	4.07±0.94	9.53±9.99
	No (*n*=3319)	*M*±*SD*	111.06±9.14	3.79±0.89	12.25±10.83
		t	10.19***	12.14***	−10.60***
Whether or not to have psychological background relatives and friends	Yes (*n*=1388)	*M*±*SD*	112.30±10.25	4.19±0.97	7.84±9.08
	No (*n*=5195)	*M*±*SD*	112.25±9.49	3.86±0.90	11.72±10.71
		t	0.19	11.59***	−13.58***

Notes: *p < 0.05, ** p < 0.01, *** p < 0.001.
Abbreviations: MHL, mental health literacy; OA, overall adaptation; UPI, university personality inventory.

Table 3 Descriptive Statistics and Correlations

	M±SD	① MHL	② OA	③ UPI
① MHL	112.26±9.66	1		
② OA	3.93±0.93	0.27***	1	
③ UPI	10.90±10.51	−0.08***	−0.45***	1

Notes:*p < 0.05, ** p < 0.01, *** p < 0.001.
Abbreviations: MHL, mental health literacy; OA, overall adaptation; UPI, university personality inventory.

overall adaptation (M 2, β =0.03, p < 0.001). Adding MHL and overall adaptation together in the model, MHL still significantly predicted UPI total score (M 5, β = 0.05, p < 0.001), while overall adaptation also significantly predicted UPI total score (M 5, β = −4.95, p < 0.001), indicating the mediating role of overall adaptation between MHL and UPI total score.

To further examine the mediation model, Model 4 of the process macro (PROCESS 3.4) was employed, with MHL as the independent variable, overall adaptation as a mediating variable, and UPI total score as the dependent variable. As recommended by Fang et al (2014),[34] a non-parametric bootstrapping method (n = 5000) was used, and a 95% confidence interval was calculated using the bias-corrected bootstrapping method. The results confirmed that the mediation model was significant (the mediation indices were −0.13, SE = 0.01, 95% CI [−0.14, −0.11]).

Supplemental Analysis

In our previous examination, we discovered that MHL and MH produced opposite results in terms of gender differences. Although female university freshers scored higher in MHL compared to male university freshers, their MH was worse than that of male university freshers. To investigate the reasons for this difference, we attempted to explore the moderating role of gender in the mediating pathway through which MHL influences MH via overall adaptation. Prior to testing the moderating effect, we centered MHL and overall adaptation to obtain the interaction terms between MHL, overall adaptation, and gender separately. After adding the interaction terms into the regression equation, the interaction term of MHL with gender had no significant predictive effect on overall adaptation (M 6, β = 0.003, p > 0.05) and had no significant predictive effect on UPI total score (M 7, β = −0.02, p > 0.05). On the other hand, the interaction term of overall adaptation with gender was a significant predictor of total UPI score (M 9, β = −0.83, p < 0.001), which indicates that gender played a moderating role in the relationship between overall adaptation and UPI total score. The results are presented in Table 5. A simple slope test was then conducted to further explore the moderating effects of gender (Figure 1). Overall adaptation had a significant positive effect on UPI total score, regardless of whether gender was male or female. However, with female university freshers, the predictive effect of overall adaptation on UPI total score was higher than that in male university freshers.

To examine the moderated mediation model, we used Model 14 of the process macro (PROCESS 3.4) to calculate the size and difference in the mediating effect by gender in the model. The results are shown in Table 6. In both male and female conditions, the confidence interval did not contain 0, indicating that the mediating effects were supported in both conditions. Moreover, the differential effect of gender on the mediation model was 0.02 [SE = 0.01, 95% CI [0.01, 0.03]), indicating that the moderated mediation model was significant.

Discussion

The Detection Rate and Population Differences of MH Problems Among University Freshers

The UPI findings revealed that the detection rate of MH problems among university freshers was 22.39%, slightly higher than previous detection rates in China. This result is consistent with the views of Wu[4] and Chen[35], who suggest that the proportion of university freshers with serious MH problems in China is increasing annually. We attribute this increase to several reasons. Firstly, not all I freshers (those with possible psychological problems) screened by the UPI necessarily

Table 4 Results of Multiple Regression Analyses

	OA						UPI								
	M1			M2			M3			M4			M5		
	β	*SE*	*t*	*β*	*SE*	*t*	*β*	*SE*	*t*	*β*	*SE*	*t*	*β*	*SE*	*t*
(Stable)	3.59	0.03	144.05***	0.72	0.13	5.43***	15.14	0.28	53.54***	24.09	1.55	15.59***	27.63	1.40	19.67***
Gender	0.00	0.02	0.01	0.11	0.02	5.04***	−1.63	0.26	−6.38***	−1.98	0.26	−7.56***	−1.42	0.24	−5.99
Origin	0.17	0.02	7.65***	0.17	0.02	7.66***	−1.08	0.26	−4.20***	−1.06	0.26	−4.14***	−0.23	0.23	−1.00
Whether or not to have studied MH education courses	0.11	0.03	3.66***	0.06	0.03	2.21*	−1.45	0.34	−4.31***	−1.31	0.34	−3.90***	−0.99	0.30	−3.27**
Whether or not to have attended MH education lectures	0.12	0.03	4.06***	0.11	0.03	3.85***	−1.57	0.34	−4.68***	−1.54	0.34	−4.60***	−1.00	0.30	−3.28**
Whether or not to have read psychology-related books	0.13	0.03	5.37***	0.09	0.02	3.60***	−1.09	0.28	−3.90***	−0.95	0.28	−3.38***	−0.52	0.26	−2.05*
Whether or not to have psychological background relatives and friends	0.20	0.03	6.75***	0.22	0.03	7.90***	−2.44	0.33	−7.38***	−2.52	0.33	−7.64***	−1.42	0.30	−4.72***
MHL				0.03	0.00	22.19***				−0.08	0.01	−5.89***	0.05	0.01	3.69***
OA													−4.95	0.13	−37.73***
R^2	0.05			0.12			0.05			0.06			0.22		
R^2_{adj}	0.05			0.07			0.05			0.01			0.17		
F	61.25***			126.74***			59.31***			56.06***			237.59***		

Notes: *p < 0.05, ** p < 0.01, *** p < 0.001. Gender (Female = 0, Male = 1); Origin (Rural area = 0, Urban area = 1); whether or not to have studied MH education courses, whether or not to have attended MH education lectures, whether or not to have read psychology-related books, whether or not to have psychological background relatives and friends (No = 0; Yes = 1).

Abbreviations: MHL, mental health literacy; OA, overall adaptation; UPI, university personality inventory.

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Table 5 Results of Multilevel Regression Analysis of Moderating Effects

	OA			UPI								
	M6			M7			M8			M9		
	β	*SE*	t	*β*	*SE*	t	*β*	*SE*	t	*β*	*SE*	t
(Stable)	0.87	0.18	4.98***	23.27	2.06	11.32***	32.44	0.52	62.19***	30.67	0.74	41.28***
Gender	0.11	0.02	5.11***	−1.99	0.26	−7.59***	−1.63	0.23	−7.04***	−1.63	0.23	−7.04***
Origin	0.17	0.02	7.66***	−1.06	0.26	−4.14***	−0.25	0.23	−1.05	−0.22	0.23	−0.96
Whether or not to have studied MH education courses	0.06	0.03	2.20*	−1.31	0.34	−3.89***	−0.93	0.30	−3.04**	−0.93	0.30	−3.06**
Whether or not to have attended MH education lectures	0.11	0.03	3.83***	−1.54	0.34	−4.59***	−0.99	0.30	−3.27**	−1.00	0.30	−3.28**
Whether or not to have read psychology-related books	0.09	0.02	3.59***	−0.95	0.28	−3.38**	−0.45	0.25	−1.78	−0.45	0.25	−1.78
Whether or not to have psychological background relatives and friends	0.22	0.03	7.92***	−2.52	0.33	−7.64***	−1.49	0.30	−4.97***	−1.49	0.30	−4.97***
MHL	0.02	0.00	15.83***	−0.07	0.02	−4.05***						
OA							−4.82	0.13	−38.07***	−4.37	0.19	−23.67***
Gender × MHL	0.003	0.002	1.37	−0.02	0.03	−0.60						
Gender × OA										−0.83	0.25	−3.34***
R^2	0.12			0.06			0.22			0.22		
R^2_{adj}	0.00			0.00			0.17			0.00		
F	111.15***			49.09***			269.07***			237.19***		

Notes: *p < 0.05, ** p < 0.01, *** p < 0.001. Gender (Female = 0, Male = 1); Origin (Rural area = 0, Urban area = 1); whether or not to have studied MH education courses, whether or not to have attended MH education lectures, whether or not to have read psychology-related books, whether or not to have psychological background relatives and friends (No = 0; Yes = 1).

Abbreviations: MHL, mental health literacy; OA, overall adaptation; UPI, university personality inventory.

Table 6 The Result of the Moderated Mediation Model Test

		Effect	Boot SE	Boot LLCI	Boot ULCI
Direct effect		0.05	0.01	0.02	0.07
Indirect effect	0=Female	−0.13	0.01	−0.15	−0.11
	1=Male	−0.11	0.01	−0.12	−0.10
	Difference	0.02	0.01	0.01	0.03

have actual psychological problems, and professional interviews are required to confirm diagnoses. In various studies, only around 1% of identified students have been found to have actual psychological problems.[4,19] Secondly, the COVID-19 pandemic has presented greater challenges to university freshers's MH. Affected by various negative emotions and psychological distress, the number of freshers experiencing MH problems has increased in recent years.

Furthermore, variance analysis revealed that the MH of urban university freshers is significantly higher than that of their rural counterparts, which aligns with Shi et al[36] studies. We suggest that this may be due to China's long-standing urban-rural dual structure, whereby the socio-economic and cultural environment in which rural freshers live before entering university may disadvantage them compared to those from urban areas.[37] Urban schools and families provide better living conditions and MH education for adolescents, which are often lacking in rural areas.[36] Thus, significant differences exist in the MH levels of university freshers from various backgrounds. The results also demonstrated that university freshers who had taken MH education courses, attended MH education lectures, read psychology-related books, and were surrounded by friends and relatives with a psychology background had significantly higher MH than those who had not participated in such activities. This highlights the effectiveness of MH education activities in adolescence in China in enhancing the MH of university freshers. China has recently promoted the construction of a social psychological service system, leading to numerous MH promotion projects and education activities being conducted in communities and schools, which provide adequate support to consolidate and improve students' MH. However, the results also show that a significant percentage of university freshers have not participated in professional MH education activities before enrollment, indicating that MH education in Chinese elementary and middle schools still requires improvement.

Based on these findings, living environment and MH education activities play crucial roles in improving university freshers's MH. To enhance the MH of students at all stages, we should implement MH education projects more comprehensively and establish an integrated MH education system in universities, middle, and primary schools at a faster pace. Additionally, we should

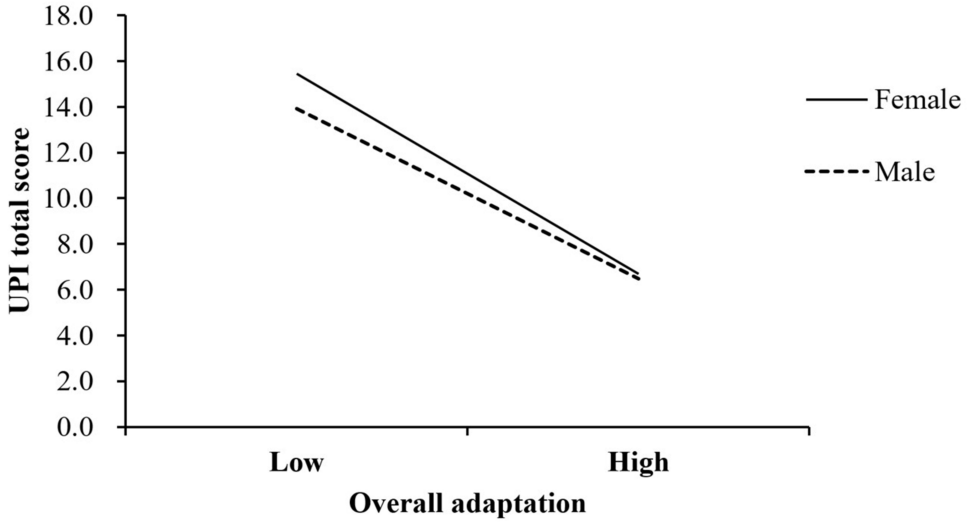

Figure 1 The moderation effects of gender.

invest more resources in economically disadvantaged and educationally under-resourced areas to promote stable improvement and balanced development of students' MHL in China.

The Relationship Between MHL and MH of University Freshers

The findings reveal that there is a positive correlation between the MHL of university freshers and their level of MH. This result confirms previous research conducted by Bjørnsen et al[38] and Yang.[39] The MHL contains six dimensions, the ability to recognize mental illness, knowledge of the risk and causes of illness, knowledge of seeking professional help, knowledge of self-help, knowledge of seeking mental health information, and attitudes towards promoting awareness of mental illness or help-seeking behavior. On one hand, having good MHL can enhance an individual's knowledge, ability, belief, and attitude about MH. On the other hand, it can also reduce the stigma surrounding mental illness and improve an individual's willingness to seek help,[6] thus contributing to better MH outcomes. Additionally, higher MHL can enable individuals to positively respond to negative life events such as mental illness, and the worries and concerns associated with MH problems,[25] which can also lead to improvements in their MH.

The Mediating Role of the Overall Adaptation

The results of the regression analysis showed that the MHL of university freshers not only directly predicts their MH but also indirectly influences it through overall adaptation, with overall adaptation playing a mediating role in the influence of MHL on MH. This suggests that university freshers with higher MHL exhibit better overall adaptation and, as a result, better MH. Adaptation is a process where individuals respond to stress, and effective coping mechanisms are necessary to avoid the negative effects of maladjustment.[22] University freshers with higher MHL are likely to have a better understanding of MH knowledge and more stable MH beliefs, which enables them to mobilize more MH resources and adopt effective coping strategies to improve their adaptive capacity and relieve negative emotions and psychological distress caused by adjustment disorders. This study has important implications for MH education in universities. First, there should be greater emphasis on prevention by enhancing MHL to cultivate the positive psychological qualities of university freshers. Second, there is a need to strengthen counseling services to help university freshers adapt better to university life, studies, and interpersonal communication. Through various channels and approaches, enrollment education can help university freshers achieve a more active and healthy psychological state when adapting to university life.

The Moderating Role of the Gender

The variance analysis of gender revealed that gender differences had opposite effects on MHL and MH, with female university freshers having higher MHL than male university freshers, but worse MH. This finding is consistent with previous research,[11,40,41] indicating that women are at higher risk of psychological disorders than men, while also having better MHL and seeking professional help more readily for MH concerns. However, existing studies do not explain this difference. We believe that one reason for this difference may be that women are more likely to express emotions and seek help,[11] and therefore more likely to be detected and diagnose MH problems than men, while men tend to avoid or hide their MH problems, which leads to higher prevalence of MH problem in women than in men.

Building upon the relationship between MHL and MH mediated by overall adaptation, we examined the moderating effect of gender. The results indicated that gender played a moderating role in the influence of overall adaptation on MH, with a significant moderating mediating effect. When university freshers were women, the indirect effect between MHL and MH through overall adaptation was stronger. This finding suggests that despite their higher MHL, female university freshers did not experience an advantage in the direct effect of MHL on MH or overall adaptation, resulting in lower levels of MH. However, the indirect effect of MHL on MH through overall adaptation was more typical for female university freshers than male university freshers. This may be due to the fact that female university freshers have higher MHL, which could be an essential psychological resource when facing stressful events such as enrollment. Female university freshers can, therefore, utilize more psychological resources to support their MH development by enhancing their adaptation levels.

These results highlight the role of gender in the relationship between MHL and MH through overall adaptation and reveal the boundary conditions of overall adaptation in influencing MH. Consequently, universities should consider two

factors when conducting MH education activities: first, implementing targeted MH education programs that break down negative gender stereotypes and specific gender roles that could hinder the development of MHL and MH among university freshers of different genders. Second, MH education should depart from traditional approaches and adopt various forms of MH education activities that enhance students' mental health knowledge, promote changes in their attitudes and habits, and stimulate positive behavioral changes through the improvement of MHL.

Limitations and Future Directions

This study has several limitations that should be acknowledged. First, while the study focused on the gender differences in MHL and MH and attempted to explain them, the underlying causes of these differences remain unclear. Future research should explore this phenomenon further. Second, a cross-sectional research design was utilized, which limits the ability to establish causal relationships between variables and does not reflect changes in MHL and MH over time. To address this, future studies should adopt a longitudinal design to collect data at multiple time points for a more comprehensive examination of the relationship between variables. Third, the sample only included university freshers from a comprehensive university, which may not fully represent the characteristics of the broader population of university freshers. As such, the generalizability of the study's findings may be limited. Future research should seek to validate the findings in different geographical areas and different types of groups to enhance the generalizability of results.

Conclusion

The results of this study confirm that the MHL of university freshers could not only directly predict their MH, but also indirectly affect their mental health through overall adaptation, which is more significant among women.These results will contribute to develop MHL Intervention Program for university freshers, which will be useful to improve the overall adaptation and MH of college freshers.

Data Sharing Statement

The application employed in this manuscript are freely available. Please contact the corresponding authors for more details.

Ethics Approval and Consent to Participate

This study were reviewed and approved by the Institutional Review Board of Henan Provincial Key Laboratory of Psychology and Behavior (numbered as 20221010003). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study did not use clinical/personal patient data. Administrative permissions and/or licenses for accessing clinical/personal patient data were not acquired. Informed consent was obtained from all individual participants included in the study.

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