

# The Influence of Personality Traits On Mental Symptoms in 5, 449 Chinese University Volunteers : A Cross-Sectional Study

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## Research Article

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# Abstract

## Background

Mental health of university volunteers is essential for the successful holding of essential meetings and sports games. The impact of personality traits on the mental symptoms of university volunteers is not well studied. The study objective is to assess personality traits as predictors of mental symptoms in university volunteers in China.

## Method

We carried out a cross-sectional study. The study sample consisted of volunteers from sixteen main universities in the city of Hangzhou. The OQ-45 scale was used to evaluate mental symptoms and the PHI was used for the measurement of personality traits. Multiple linear regression analysis was used to study relationships between personality factors and mental symptoms.

## Results

Estimation of personality traits revealed higher scores on subscales of hypomania, depression, and psychopathic deviance. The OQ-45 scale identified 1.4% of volunteers as having psychological disorders. PHI scores were positively correlated with scores on the OQ-45 scale ( $P < 0.01$ ). Anxiety was correlated particularly strongly with interpersonal relationship score and total OQ-45 score ( $r = 0.6$ ,  $P < 0.05$ ). Furthermore, we found that personality traits could influence the explicit mental symptoms of the volunteers. Volunteers with traits of anxiety and depression reported a significant impact on their mental symptoms.

## Conclusions

The OQ-45 and PHI scales can be used to screen volunteers with mental symptoms. Inner personality traits could be used to predict the mental symptoms of volunteers in China. Our results might assist organizers of future conferences and games in selecting appropriate university volunteers.

## Introduction

The execution of essential meetings and sports games increasingly depends on millions of volunteers who serve in a variety of dedicated roles, ranging from tour guides to language translators. To some extent, it would not be possible to organize these essential meetings or games without volunteers' commitment and dedication. Furthermore, the heavy reliance on volunteers has been credited as an important factor in the meeting's or game's success. Some volunteers involved in meetings or games should be university students recruited to provide translation services to visitors in the main venue. Over

several days' service, these university volunteers provide various services for thousands of officials from foreign countries.

A high quality of volunteer mental health is a critical foundation for the successful execution of essential meetings or games. It is known that many mental disorders occur at an early age and are marked by peak onset during university years<sup>[1]</sup>. The World Health Organization (WHO) conducted a worldwide mental health survey of university students across eight countries. The results showed that 35% of university students presented with at least one common lifetime disorder, while 31% presented with at least one 12-month disorder. According to a systematic review and meta-analysis of studies from 63 countries, the one-year population prevalence of mental disorders is 17.6%<sup>[2]</sup>. Another study<sup>[3]</sup> determined that the estimated 12-month prevalence is 9.8–19.1% in the general adult population, based on data from 28 countries across the world. Previous studies have suggested that mental disorders are common among university students and that less than 25% of individuals with a mental illness sought treatment in the year prior to being surveyed.<sup>[4, 5]</sup> However, although volunteerism is considered to serve as the foundation of essential meetings and games, no published studies have yet investigated the mental symptoms of volunteers. There have also been no published papers examining the personality traits contributing to mental symptoms. Hence, screening for mental disorders among university volunteers is valuable for preventing the onset of mental disorders<sup>[6, 7]</sup>.

Moreover, studying the associations between personality traits and mental symptoms has practical implications for further psychological research. Previous research has shown that personality traits are associated with depression<sup>[8]</sup> and self-reported health status<sup>[9]</sup> in the general population. Personality traits reflected differences in the responses of neuroadaptive systems and mediated concepts of temperament and personal character. According to trait theory, volunteers' personality traits and motivation are the main factors affecting their emotions, participation, and behavior in volunteering service. Carlo G. et al.<sup>[10]</sup> found that the personality traits of agreeableness and extraversion are positively correlated with volunteer behavior under the regulation of prosocial value motivation. Snyder M. et al.<sup>[11]</sup> defined volunteerism as a process with three sequential stages (antecedents, experiences, and consequences). They considered personality to be one of the main predictors of volunteer behavior during the antecedent stage. Furthermore, personality disorders are highly correlated with social anxiety disorder<sup>[12]</sup> and self-harm in adolescents<sup>[13]</sup>. Personality disorder is also often accompanied by somatization, impulsivity, instability, and emotion dysregulation<sup>[14]</sup>. However, a long-standing debate has existed regarding the relationship between personality traits and mental symptoms<sup>[15]</sup>.

Therefore, it is clear that the bad psychological and emotional status of volunteers might hinder successful realization of important meetings and games. Volunteers with negative mental symptoms might influence service quality and put conference security at risk. Hence, it is critical to better understand volunteers' psychological characteristics. In this study, we investigated volunteers' mental symptoms before their formal involvement in important meetings or games. This study aimed to screen out

volunteers with psychological problems and to examine whether personality traits contribute to mental symptoms in university volunteers.

## Method

### Study population

This study was carried out in the city of Hangzhou in April 2016. At this time, the city was home to 40 colleges and universities and about 481,000 university students. More than ten thousand university students signed up as potential volunteers. Volunteers were recruited from 16 leading undergraduate universities in the study city. The majority of recruited volunteers were sophomores, juniors, master's students, and doctoral students. After two rounds of face-to-face interviews, a total of 5,473 university students were preliminarily selected as volunteers. Fifteen volunteers were excluded for being younger than 18, and nine volunteers were excluded for being older than 60. The final data set included 5,449 university students who were primarily engaged in volunteering services at the main conference site.

### Investigation methods

Psychological testing was carried out on each selected volunteer using the psychological health inventory (PHI) and the OQ-45 scale (Outcome Questionnaire 45) with the goal of screening out volunteers with explicit emotional symptoms. Investigators were staff of the Hangzhou Seventh People's Hospital, the largest specialized hospital for mental symptoms in Hangzhou. All investigators were well-trained regarding the objectives, methods, and content of this investigation.

### Scales of personality traits and mental symptoms

The PHI was the revised Chinese version of the MMPI (Minnesota Multiphasic Personality Inventory). This version shortens the MMPI's long items and allowed quick screening of subjects with psychological disorders. The PHI consisted of three validity subscales and seven clinical subscales. The three validity subscales included Q (questions that cannot be answered), L (lie), and F (malingering, or deliberate mischief). The seven clinical subscales included somatization (SOM), depression (DEP), anxiety (ANX), psychopathic deviance (PSD), hypochondria (HYP), unrealistic (UNR), and hypomania (HMA). There were 168 items on the PHI. Validity scales included Q (items that have no answer or can't be answered), L (23 items), and F (23 items). Clinical scales consisted of SOM (27 items), DEP (26 items), ANX (23 items), PSD (24 items), HYP (24 items), UNR (22 items), and HMA (20 items). The total score (T score) of each

subscale was calculated according to the following formula: 
$$T = 50 + \frac{10 \times (X - M)}{S_d}$$
 in which  $X$  was the origin score,  $M$  was the mean value, and  $S_d$  was the standard deviation. A subscale T score larger than 60 was considered a mild mental problem. A subject with a T score larger than 70 for a certain subscale was classified as having a severe mental problem. In many Chinese studies, the PHI has shown good content and construct validity across different populations [16, 17].

The OQ-45 questionnaire was developed by Dr. Michael J. Lambert, a well-known American psychologist. It has been an essential tool for studying the effects of psychological intervention/counseling. The OQ-45 scale is also used to measure mental symptom status [18]. The questionnaire has three subscales: symptom distress (SD), interpersonal relationship (IR), and social role (SR). Symptom distress includes emotional symptoms such as anxiety, depression, and obsession. The IR and SR subscales are used to understand an individual's social adaptability, and the sum of IR and SR scores is often used to evaluate quality of life. A total score (TS) on the OQ-45 scale of >63 indicates clinically significant symptoms of mental illness. An SD subscale score of >35 indicates the presence of mood discomfort. A previous study [19] reported that the test-retest reliabilities of the OQ-45 scale and its three subscales were 0.66-0.86. In our study, the Cronbach's alpha coefficient of the OQ-45 scale was 0.93, while those of the three subscales ranged from 0.70 to 0.90. Previous studies in Japan [20] and Israel [21] have shown that the OQ-45 scale demonstrates trustable validity. A recent study in the Netherlands [22] showed that the OQ-45 scale can satisfactorily discriminate between psychiatric patients and normal respondents.

## Statistical methods

IBM SPSS Statistics 17.0 software was used for all analyses. Quantitative variables were expressed as mean±standard deviation, and qualitative variables were expressed as number and percentage. The independent sample t-test was used to test differences in scale scores. Pearson correlation coefficient was applied to analyze the correlation between scores on different scales or subscales. A multiple linear regression model was used to examine the association between personality traits and mental symptoms.  $P < 0.05$  was considered to be significant.

## Ethical approval

All participants provided written informed consent. This study was carried out according to the Declaration of Helsinki and was approved by the Ethics Committee of Affiliated Mental Health Center & Hangzhou Seventh People's Hospital, Zhejiang University School of Medicine (Code No. 10; date of approval: August 8, 2018).

# Results

## Social demographics of study population

The average age of the study population was (20.7±1.7) y, ranging from 18 to 44 y (Table 1). Most of the university students were female (74.6%) and unmarried (99.6%). The university students were mainly undergraduates (90.8%).

### Table 1. Social demography of study population

Variable	Category	Frequency	Percent (%)
Gender	Male	1380	25.3
	Female	4069	74.7
Marriage	Unmarried	5425	99.5
	Married	24	0.5
Education level	Junior university	65	1.2
	Undergraduate	4947	90.8
	Master	394	7.2
	Doctor	43	0.8

### Rate of detection of mental problems for the PHI and OQ-45 scales

The detection rate of mild mental problems for the HMA subscale was 16.8%, followed by the detection rates of DEP (14%) and PSD (12.6%; Figure 1-A). However, the UNR subscale had the highest rate of detection for severe mental problems (5.3%). The detection rate of anxiety was 4.7%, followed by somatization (4.1%) and hypochondria (4.1%). The detection rate of severe mental problems for the HMA subscale was only 2.3%. For the OQ-45 scale, the total detection rate of psychological disorders was 1.4% (Figure 1-B). The detection rate of mental problems in interpersonal relationships and social roles was 2.6%, followed by issues affecting emotional discomfort (1.5%).

### Hypomania scores among volunteers were higher than average

Firstly, we compared scores on each subscale of the PHI by gender. The HMA subscale scores of male university students were significantly higher than average ( $P < 0.001$ ; Figure 2-A). A similar result was found for female university students ( $P < 0.001$ ; Figure 2-B). Scores on other PHI subscales were lower in volunteers compared to the general population ( $P < 0.001$ ). Total and all dimensional scores on the OQ-45 scale were significantly lower than for the general population ( $P < 0.001$ ; Figure 2-C).

### PHI scores were correlated OQ-45 scale scores

Each subscale of the PHI was significantly correlated with each subscale of the OQ-45 scale (Figure 3). Scores on the SOM, DEP, ANX, PSD, and UNR subscales were positively correlated with scores on all three dimensions of the OQ-45, as well as the total score (all  $r > 0.4$ ,  $P < 0.05$ ). Notably, ANX was strongly correlated with IR and total OQ-45 scores ( $r = 0.6$ ,  $P < 0.05$ ). Although the correlations were significant between the HMA subscale and each subscale of the OQ-45 scale, the coefficients were somewhat small.

### Internal personality traits influenced the explicit mental symptoms of volunteers

According to the results of multiple regression analysis, SOM, DEP, ANX, PSD, HYP, and UNR were included in all four regression models (Table 2). The standardized regression coefficient was highest between anxiety and social role ( $\beta = 0.263, P < 0.01$ ). Anxiety was also a main influencing factor in model 4 ( $\beta = 0.240, P < 0.01$ ). HYP had a significant negative impact on explicit emotional symptoms in each model. HMA was a significant influencing factor of interpersonal relationship ( $\beta = -0.029, P = 0.026$ ).

**Table 2.** Standardized regression coefficients of four models of the impact of internal personality traits on the explicit emotional symptoms of volunteers

Independent variables	Model 1	Model 2	Model3	Model4
	DV = SD	DV = IR	DV = SR	DV = TS
SOM	0.197**	0.081**	0.083**	0.161**
DEP	0.190**	0.169**	0.186**	0.203**
ANX	<b>0.262**</b>	0.130**	0.202**	<b>0.240**</b>
PSD	0.037**	0.100**	0.093**	0.070**
HYP	-0.107*	-0.039*	-0.040*	-0.085**
UNR	0.177**	0.163**	0.113**	0.177**
HMA	0.016	-0.029*	0.013	0.005

Model 1: the dependent variable is IR; model 2: the dependent variable is ES; model 3: the dependent variable is SR; model 4: the dependent variable is the total OQ-45 score. DV: dependent variable; SD: symptom distress; IR: interpersonal relationship; SR: social role; TS: total score on the OQ-45 scale; SOM: somatization; DEP: depression; ANX: anxiety; PSD: psychopathic deviance; HYP: hypochondria; UNR: unrealistic; HMA: hypomania; age, gender, and education level were set as controlled variables in each model.

## Discussion

Our results show that the majority of mental problems detected in volunteers by the PHI scale were depression, hypomania, and psychopathic deviance. The UNR subscale had the highest rate of detection of severe mental problems. The total detection rate for psychological disorders detected by the OQ-45 scale was low among university volunteers. As expected, we found a significant correlation between personality traits and mental symptoms of university volunteers. Volunteers with the personality traits of somatization, depression, anxiety, psychopathic deviance, or unrealistic nature were more likely to develop mental symptoms with respect to symptom distress, interpersonal relationships, and social roles. However, volunteers with traits of hypochondria were less likely to develop mental problems.

We found that university volunteers tended to report a better mood than the general population. Nearly 1.4% of volunteers were diagnosed with mental disorders, and the predominant personality trait observed in volunteers was hypomania. Scores on the hypomania scale were significantly higher among university volunteers than the general population. According to the results of WHO World Mental Health Surveys [23], 1.9% of university students were considered to have mental disorders, the vast majority of which included mania/hypomania (77.9%). Hypomania occurs among individuals between 15 and 24 years old and co-occurs with depressive symptoms [24]. University students with hypomania were characterized as hyperactive, optimistic, and prone to overestimating themselves. Hence, the elevated hypomania scores seen in our study could be associated with unrealistically positive self-appraisal, over-activity, and low self-control [25]. We conclude that personality traits can be useful indices for the screening and prevention of mental problems in university volunteers.

In general, we found that personality traits can predict the occurrence of mental symptoms among volunteers. In particular, we found that the traits of anxiety and depression were major predictors of susceptibility to mental symptoms. Our results were comparable to those of previous research, showing a good concordance between personality traits and psychiatry [26-28]. A previous study [29] reported that individuals with personality disorders had poorer outcomes for depression treatment than those with no personality disorders ( $OR = 2.16$ ,  $CI = 1.83-2.56$ ). Robison E.J. et al. [30] found that personality traits have unique associations with chronicity and an earlier onset of depression, and these associations remained the same over time. The precise mechanism of this phenomenon remains unclear, reflecting our incomplete knowledge of the biology underlying personality traits' impact on mental symptoms. However, a previous cohort study on neuroendocrine [31] found that personality traits are associated with hypothalamic-pituitary-adrenal (HPA) axis functioning among adolescents. Baseline cortisol levels are related to facets of several personality traits, including neuroticism, extraversion, and conscientiousness. Hence, we suggest that personality traits might stably influence the occurrence of mental symptoms among volunteers through alteration of the HPA axis.

In particular, we found a strong independent association between the trait of anxiety and mental symptoms. Our results were similar to those of a previous study [32] and support the association of anxiety traits with the emotional anxiety experience [33]. A recent study [34] found that anxiety traits could lead to prolonged HPA hyperactivity. In other words, volunteers with anxious personalities might be prone to developing a variety of stress-induced psychopathologies. However, the etiology of anxiety is very complex [35]. Both genetic variants and environmental factors have been associated with anxiety disorders [36]. The molecular alterations in individuals' brains, including changes to neurotransmitters, neuroendocrine factors, and mitochondrial function, might explain symptoms of distress in individuals with high anxiety [37]. Oxidative stress also contributes to the etiology of mental symptoms related to anxiety [38]. A recent study [39] characterized the molecular underpinnings of anxiety and identified changes to mitochondrial pathways, oxidative phosphorylation, and oxidative stress. An animal study [40] indicated that reactive oxygen species can affect anxiety in animals by altering oxidative stress in the

brain. Controversially, anxiety-like behaviors can be attenuated by inhibition of NOX2-derived oxidative stress [41]. Oxidative stress might serve to bridge the pathophysiological gap between anxiety and various diseases, including psychiatric illnesses [42]. Hence, we suggest that there might be a relationship between oxidative stress metabolism and the genesis of anxiety traits, ultimately resulting in the occurrence of symptoms of distress and poor social adaptability.

As a sub-trait of neuroticism, we also found that the trait of depression was moderately correlated with mental symptoms, consistent with a previous study [32]. Current evidence provides tentative insights regarding the association between depression and mental symptoms. First, it has been well-documented that depression is associated with poor interpersonal communication [43]. Traits of depression, combined with emotional stress from academic difficulties and interpersonal relationships, might increase risk of mental symptoms among volunteers. An animal model [44] found that early-stage stress could influence maturation of the HPA axis, while later-stage stress could lead to problems with interpersonal and social relationships. Hence, distress and dissatisfaction with interpersonal relationships and social roles could reflect internal psychological problems, such as depression, among volunteers. Secondly, we found that depression was associated with symptoms of distress, including symptoms of depression and anxiety, consistent with previous studies [45]. Van H. L. et al. [46] found that individuals with personality disorders have a much higher risk of depression symptoms than the general population. Gene polymorphisms, such as retinoid-related orphan receptor alpha (RORA) gene variation, might contribute to genetic susceptibility to depression [47]. Overall, the occurrence of mental symptoms probably reflects additional underlying psychological factors, such as those about an individual's personality [48].

In summary, the main findings of our study are the associations between personality traits and mental symptoms. To our knowledge, this the first study to investigate these associations among a large sample of university volunteers in China. Furthermore, we were able to screen out some volunteers with mental problems, although they accounted for a small proportion of total volunteers. Identification of volunteers predisposed to mental symptoms might allow more effective implementation of early prevention programs. There were also some limitations to our study. First, our conclusions regarding the link between personality traits and mental symptoms remain tentative. There might also be some psychopathology and confounders for which we did not account. Second, our study might underestimate the true diagnostic prevalence of mental disorders among volunteers. However, our research is nevertheless valuable as a way to screen for personality disorders and common mental disorders and capture the large majority of cases [49]. Despite these limitations, this is the first study to use a large-scale sample of university volunteers to investigate how personality traits are associated with mental symptoms. Moreover, our study is the first to use the PHI and OQ-45 scales to analyze associations between personality traits and mental symptoms.

We conclude that personality traits might be the antecedent variables of volunteers' mental symptoms and behaviors. The personality traits of volunteers could reflect their behavioral tendencies with regard to participation in the service of important meetings or games, allowing support for individual guidance of

volunteers. These findings highlight the importance of taking personality traits into account when screening mental symptoms among university volunteers for large conferences or national games.

## Abbreviations

*CI*

confidence interval; SOM:somatization; DEP:depression; ANX:anxiety; PSD:psychopathic deviate; HYP:hypochondria; UNR:unrealistic; HMA:hypomania; SD:symptom distress; IR:interpersonal relationship; SR:social role.

## Declarations

### Ethics approval and consent to participate

All participants provided written informed consent. This study was carried out according to the Declaration of Helsinki and was approved by the Ethics Committee of Affiliated Mental Health Center & Hangzhou Seventh People's Hospital, Zhejiang University School of Medicine (Code No. 10; date of approval: August 8, 2018).

### Consent for publication

Not Applicable.

### Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

### Competing interests

The corresponding author, on behalf of all coauthors, has declared no conflict of interest.

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### Authors' Contributions

Conceptualisation (Zhaoqiang Jiang, Zhe Ni, Jianlin Lou)

Data curation (Zhaoqiang Jiang)

Formal analysis (Zhaoqiang Jiang)

Funding acquisition (Zhaoqiang Jiang, Guoming Lin)

Investigation (Junqiang Chen, Junfei Chen, Lingfang Feng, Xiyi Jiang, Mingying Jin)

Methodology (Zhe Ni)

Project administration (Huiquan Jiang)

Resources (Zhe Ni, Huiquan Jiang, Guoming Lin)

Software (Zhaoqiang Jiang)

Supervision (Huiquan Jiang, Jianlin Lou)

Validation (Zhaoqiang Jiang, Zhe Ni)

Visualisation (Zhaoqiang Jiang)

Writing - original draft (Zhaoqiang Jiang, Zhe Ni)

Writing - review & editing (Jianlin Lou)

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### **Authors' information (optional)**

Not applicable.

### **Novelty and impact:**

We used two new scales to screen the mental health of university volunteers: the PHI scale, which focuses on personality traits, and the OQ-45 scale, which focuses on the status of mental symptoms. This study represents the first study in China to investigate the association between personality traits and mental symptoms. Our study provides novel evidence that personality traits correlate with mental symptoms across a large sample of volunteers in China.

## **References**

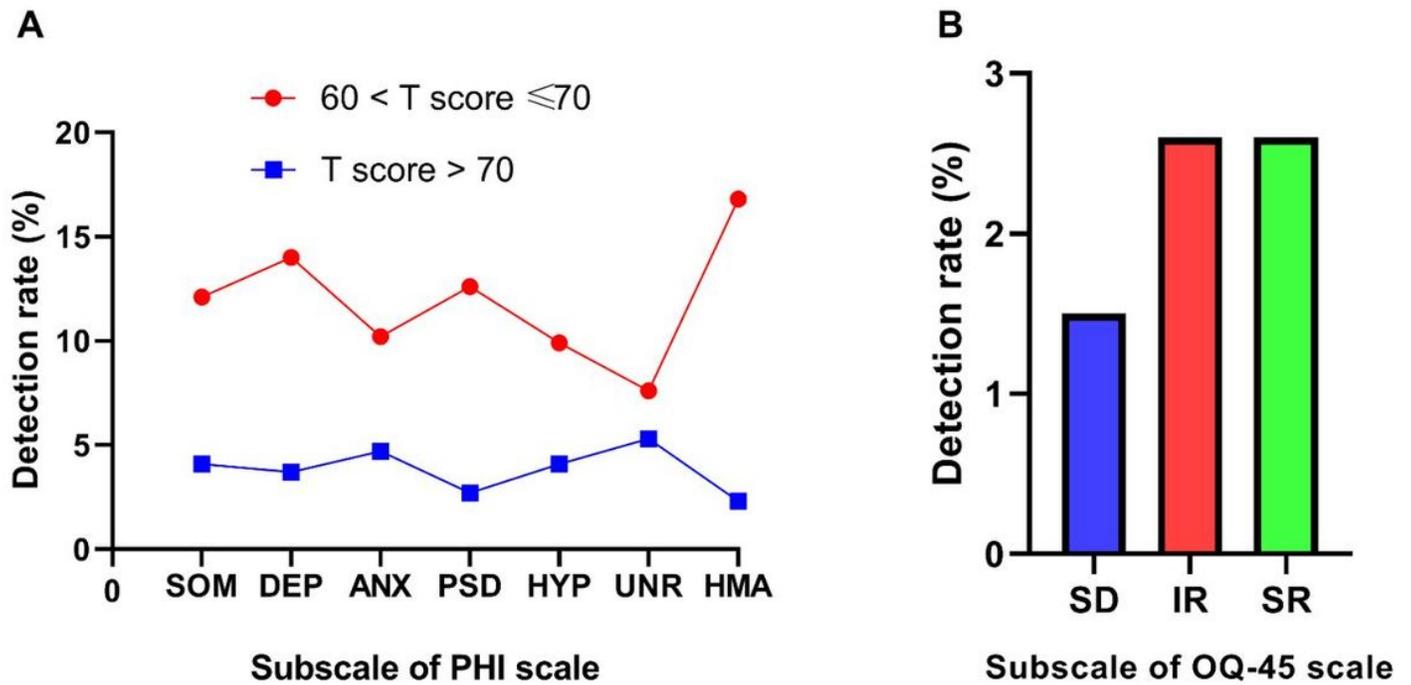
1. Kessler RC, Amminger GP, Aguilar-Gaxiola S, et al. Age of onset of mental disorders: a review of recent literature. *Curr Opin Psychiatry*. 2007;20(4):359–64.
2. Steel Z, Marnane C, Iranpour C, et al. The global prevalence of common mental disorders: a systematic review and meta-analysis 1980–2013. *Int J Epidemiol*. 2014;43(2):476–93.
3. Kessler RC, Aguilar-Gaxiola S, Alonso J, et al. The global burden of mental disorders: an update from the WHO World Mental Health (WMH) surveys. *Epidemiol Psychiatr Soc*. 2009;18(1):23–33.

4. Pedrelli P, Nyer M, Yeung A, et al. College Students: Mental Health Problems and Treatment Considerations. *Acad Psychiatry*. 2015;39(5):503–11.
5. Bruffaerts RA-O, Mortier PA-O, Auerbach RA-O, et al. Lifetime and 12-month treatment for mental disorders and suicidal thoughts and behaviors among first year college students. *Int J Methods Psychiatr Res*. 2019;28(2):e1764.
6. Kessler RC, Santiago PN, Colpe LJ, et al. Clinical reappraisal of the Composite International Diagnostic Interview Screening Scales (CIDI-SC) in the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Int J Methods Psychiatr Res*. 2013;22(4):303–21.
7. Ali GC, Ryan G, De Silva MJ. Validated Screening Tools for Common Mental Disorders in Low and Middle Income Countries: A Systematic Review. *PLoS One*. 2016;11(6):e0156939.
8. Parker G, Manicavasagar V, Crawford J, et al. Assessing personality traits associated with depression: the utility of a tiered model. *Psychol Med*. 2006;36(8):1131–9.
9. Topp M, Vestbo J, Mortensen EL. Personality Traits and Mental Symptoms are Associated with Impact of Chronic Obstructive Pulmonary Disease on Patients' Daily Life. *Copd*. 2016;13(6):773–8.
10. Carlo G, Okun MA, Knight GP, et al. The interplay of traits and motives on volunteering: agreeableness, extraversion and prosocial value motivation. *Personality and Individual Differences*. 2005;38(6):1293–305.
11. Snyder M, Omoto A. Volunteerism: Social Issues Perspectives and Social Policy Implications. *Social Issues and Policy Review*. 2008;2:1–36.
12. Lampe L. Avoidant personality disorder as a social anxiety phenotype: risk factors, associations and treatment. *Curr Opin Psychiatry*. 2016;29(1):64–9.
13. Ayodeji E, Green J, Roberts C, et al. The influence of personality disorder on outcome in adolescent self-harm. *Br J Psychiatry*. 2015;207(4):313–9.
14. Schmaling KB, Fales JL, Linehan MM. Treatment for Borderline Personality Disorder and Secondary Effects on Somatization. *J Pers Disord*. 2020:1–9.
15. González-Valero G, Zurita-Ortega F. Use of Meditation and Cognitive Behavioral Therapies for the Treatment of Stress, Depression and Anxiety in Students. A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*. 2019;16(22):4394.
16. Fan CX, Ma SB. Results of psychological health inventory (phi) in college students. *Chin J School Health*. 1998;19(4):262–4 (in Chinese).
17. Song WZ. The Compilation of Psychological Health Inventory (PHI). *Psychological ence*. 1992;;2:36-40 (in Chinese).
18. Lambert MJ. Outcome in psychotherapy: the past and important advances. *Psychotherapy (Chic)*. 2013;50(1):42–51.
19. Lambert M, Hansen N, Umphress V. Administration and scoring manual for the Outcome Questionnaire (OQ 45.2). Wilmington, DL: American Professional Credentialing Services. 1996.

20. Takara R, Beecher ME, Okiishi JC, et al. Translation of the Outcome Questionnaire-45 (OQ) into Japanese: A cultural adaptation. *Psychother Res*. 2017;27(2):154–66.
21. Gross R, Glasser S, Elisha D, et al. Validation of the Hebrew and Arabic Versions of the Outcome Questionnaire (OQ-45). *Isr J Psychiatry Relat Sci*. 2015;52(1):33–9.
22. Timman R, de Jong K, de Neve-Enthoven N. Cut-off Scores and Clinical Change Indices for the Dutch Outcome Questionnaire (OQ-45) in a Large Sample of Normal and Several Psychotherapeutic Populations. *Clin Psychol Psychother*. 2017;24(1):72–81.
23. Auerbach RP, Mortier P, Bruffaerts R, et al. Mental disorder comorbidity and suicidal thoughts and behaviors in the World Health Organization World Mental Health Surveys International College Student initiative. *Int J Methods Psychiatr Res*. 2019;28(2):e1752.
24. Stahl SM, Morrissette DA, Faedda G, et al. Guidelines for the recognition and management of mixed depression. *CNS Spectr*. 2017;22(2):203–19.
25. Twenge JM, Gentile B, DeWall CN, et al. Birth cohort increases in psychopathology among young Americans, 1938–2007: A cross-temporal meta-analysis of the MMPI. *Clin Psychol Rev*. 2010;30(2):145–54.
26. Corr PJ, Perkins AM. The role of theory in the psychophysiology of personality: from Ivan Pavlov to Jeffrey Gray. *Int J Psychophysiol*. 2006;62(3):367–76.
27. Kotov R, Gamez W, Schmidt F, et al. Linking "big" personality traits to anxiety, depressive, and substance use disorders: a meta-analysis. *Psychol Bull*. 2010;136(5):768–821.
28. Alizadeh Z, Feizi A, Rejali M, et al. The Predictive Value of Personality Traits for Psychological Problems (Stress, Anxiety and Depression): Results from a Large Population Based Study. *J Epidemiol Glob Health*. 2018;8(3–4):124–33.
29. Newton-Howes G, Tyrer P, Johnson T, et al. Influence of personality on the outcome of treatment in depression: systematic review and meta-analysis. *J Pers Disord*. 2014;28(4):577–93.
30. Robison EJ, Shankman SA, McFarland BR. Independent associations between personality traits and clinical characteristics of depression. *J Nerv Ment Dis*. 2009;197(7):476–83.
31. Laceulle OM, Nederhof E, van Aken MA, et al. Adolescent personality: associations with Basal, awakening, and stress-induced cortisol responses. *J Pers*. 2015;83(3):262–73.
32. Douven E, Staals J, Schievink SHJ, et al. Personality traits and course of symptoms of depression and apathy after stroke: Results of the CASPER study. *J Psychosom Res*. 2018;111:69–75.
33. Knowles KA, Olatunji BO. Specificity of trait anxiety in anxiety and depression: Meta-analysis of the State-Trait Anxiety Inventory. *Clin Psychol Rev*. 2020;82:101928.
34. McLaughlin KA, Hatzenbuehler ML. Stressful life events, anxiety sensitivity, and internalizing symptoms in adolescents. *J Abnorm Psychol*. 2009;118(3):659–69.
35. Taylor S, Jang KL, Stewart SH, et al. Etiology of the dimensions of anxiety sensitivity: a behavioral-genetic analysis. *J Anxiety Disord*. 2008;22(5):899–914.

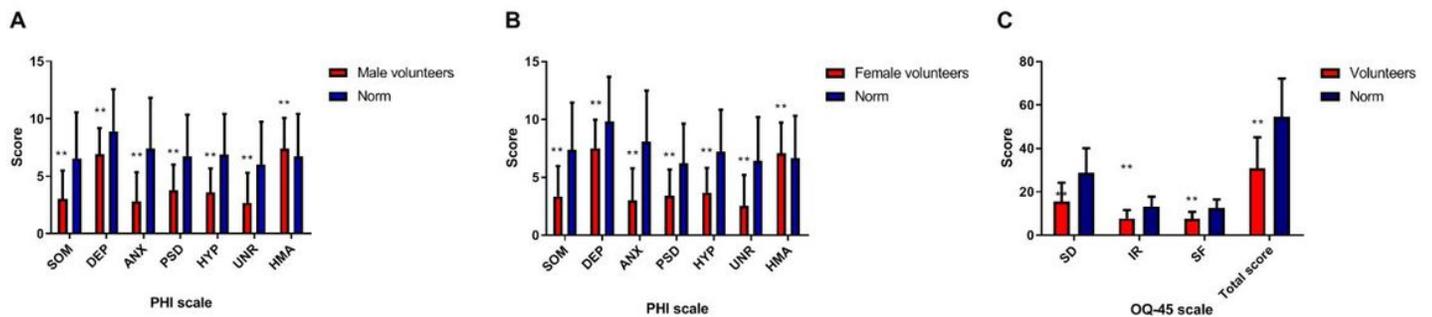
36. Hettema JM, Prescott CA, Myers JM, et al. The structure of genetic and environmental risk factors for anxiety disorders in men and women. *Arch Gen Psychiatry*. 2005;62(2):182–9.
37. Weger M, Sandi C. High anxiety trait: A vulnerable phenotype for stress-induced depression. *Neurosci Biobehav Rev*. 2018;87:27–37.
38. Hovatta I, Juhila J, Donner J. Oxidative stress in anxiety and comorbid disorders. *Neurosci Res*. 2010;68(4):261–75.
39. Filiou MD, Moy J, Wang M, et al. Effect of an anti-depressant on mouse hippocampus protein turnover using MIMS. *Surf Interface Anal*. 2014;46(Suppl 1):144–6.
40. Nussbaumer M, Asara JM, Teplytska L, et al. Selective Mitochondrial Targeting Exerts Anxiolytic Effects In Vivo. *Neuropsychopharmacology*. 2016;41(7):1751–8.
41. Huang R, Wu J, Zheng Z, et al. The Construction and Analysis of ceRNA Network and Patterns of Immune Infiltration in Mesothelioma With Bone Metastasis. *Front Bioeng Biotechnol*. 2019;7:257.
42. Matsushita M, Kumano-Go T, Sukanuma N, et al. Anxiety, neuroticism and oxidative stress: cross-sectional study in non-smoking college students. *Psychiatry Clin Neurosci*. 2010;64(4):435–41.
43. Natoli AP, Nelson SM, Lengu KJ, et al. Sensitivity to criticism differentially mediates the relationship between interpersonal problems and state and trait depression. *Personal Ment Health*. 2016;10(4):293–304.
44. Corniquel MB, Koenigsberg HW, Likhtik E. Toward an animal model of borderline personality disorder. *Psychopharmacology (Berl)*. 2019;236(8):2485–500.
45. Klein DN, Kotov R, Bufferd SJ. Personality and depression: explanatory models and review of the evidence. *Annu Rev Clin Psychol*. 2011;7:269–95.
46. Van HL, Kool M. What we do, do not, and need to know about comorbid depression and personality disorders. *Lancet Psychiatry*. 2018;5(10):776–8.
47. Ming Q, Wang X, Chai Q, et al. Retinoid-related orphan receptor alpha (RORA) gene variation is associated with trait depression. *Psychiatry Res*. 2015;229(1–2):629–30.
48. Malhi GS, Mann JJ. Depression. *Lancet*. 2018;392(10161):2299–312.
49. Ballester L, Alayo I. Accuracy of online survey assessment of mental disorders and suicidal thoughts and behaviors in Spanish university students. Results of the WHO World Mental Health- International College Student initiative. *PLoS One*. 2019;14(9):e0221529.

## Figures



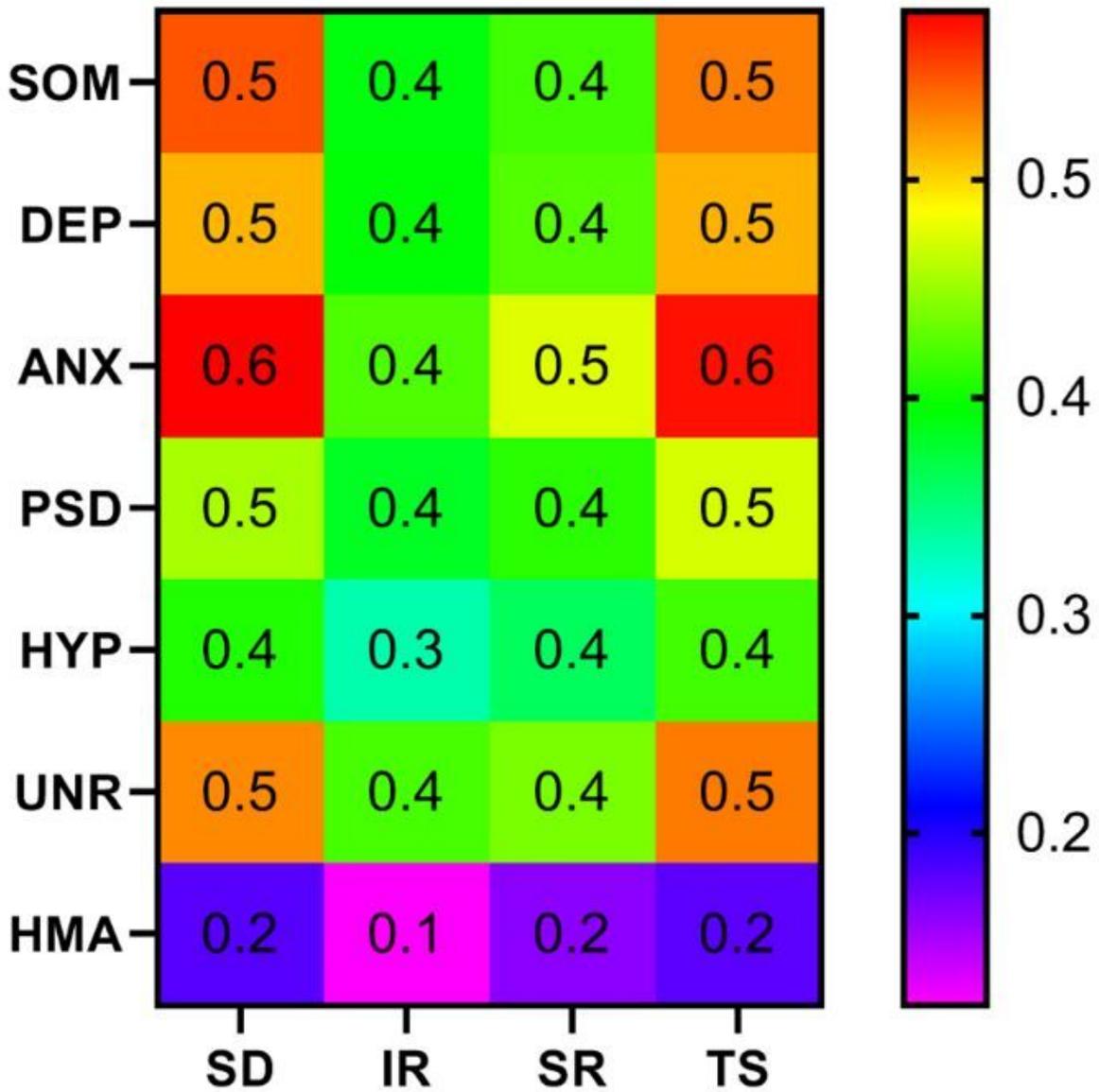
**Figure 1**

Detection rate of personality traits and mental symptoms in each subscale of PHI and OQ-45 scale. Note: (A): detection rate of mental problems in each subscale of PHI; (B): detection rate of mental problems in each subscale of OQ-45 scale; SOM: somatization; DEP: depression; ANX: anxiety; PSD: psychopathic deviate; HYP: hypochondria; UNR: unrealistic; HMA: hypomania; SD: symptom distress; IR: interpersonal relationship; SR: social role.



**Figure 2**

Comparison of PHI and OQ-45 scale scores between volunteers and the norm Note: SOM (somatization); DEP (depression); ANX (anxiety); PSD (psychopathic deviate); HYP (hypochondria); UNR (unrealistic); HMA (hypomania); IR (interpersonal relationship); SD (symptom distress); SR (social role); \*\*: P < 0.001, compared with the norm.



**Figure 3**

Correlation between each subscale in the PHI and OQ-45 scale Note: SOM (somatization); DEP (depression); ANX (anxiety); PSD (psychopathic deviate); HYP (hypochondria); UNR (unrealistic); HMA (hypomania); IR (interpersonal relationship); SD (symptom distress); SR (social role)