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Research paper

Personality traits and depressive symptoms among Chinese older people: A network approach

Jia Li [a,*], Jihong Zhang [b]

[a] Department of Social Work, Faculty of Social Science, The Chinese University of Hong Kong, Hong Kong SAR, China
[b] Department of Counseling, Leadership, and Research Methods, University of Arkansas, United States of America

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ABSTRACT

Background: The present study aims to investigate the network structure of depressive symptoms, the interrelationships between individual personality traits and depressive symptoms, and gender differences among Chinese older people aged 60 and above.
Method: We performed network analyses with a regularized Graphical Gaussian Model and a case-dropping bootstrap approach. A sample of 4876 older Chinese people aged 60+ was included in the analyses. We investigated the central symptoms in the depression network and the bridge nodes that connect personality facets and depressive symptoms. Gender differences were investigated by testing the global strength, network invariance, and edge weights.
Results: *Sadness* and *depressed mood* were the most central depressive symptoms, while somatic symptoms such as *restless sleep* were the least central. Neurotic facets, particularly "*worry a lot*" and "*get nervous easily*", played significant bridging roles in the web of personality traits and depressive symptoms. Gender differences were observed in three edges among different personality traits (*rude-worried, original-worried, and forgiving-nervous*).
Limitation: The study adopts a cross-sectional dataset, and therefore, cannot track the network changes over time or conclude a causal relationship.
Discussion: The study calls for more focus and prioritization on sadness, depressed mood and neurotic traits in the identification of depression among older Chinese people. Future researchers and practitioners should better understand of older Chinese adults' worry and nervousness to develop appropriate practices and policies.

1. Introduction

Personality traits have been linked to various physical and mental health outcomes (e.g., Jokela et al., 2013; Luchetti et al., 2014; Oshio et al., 2018). One of the most famous models of personality traits is the Five-Factor Model, which includes openness (e.g., imagination, curiosity), conscientiousness (e.g., self-discipline), extraversion (e.g., sociability), agreeableness (e.g., tolerance and acceptance), and neuroticism (e.g., emotional instability and tendency to anxiety) (Costa Jr and McCrae, 1990).

Depression is a complex and multifaceted mental health disorder, and there is a growing trend of depression among the older population (Abdoli et al., 2022). Based on a recent meta-analysis paper, the prevalence of depression among older people is 35.1 % (Cai et al., 2023). Depression has been associated with various personality traits, especially neuroticism (e.g., Kotov et al., 2010; Puyané et al., 2022). Over recent years, the critical role of personality traits in later-life depression has also been recognized (e.g., Koorevaar et al., 2013; Koorevaar et al., 2017). However, most previous studies operationalize both depression and personality traits as an overall score of multiple items, which leads to a poor understanding of the concurrent relationship between individual depressive symptoms and each personality facet. To address this research gap, this study aims to adopt a network approach to identify the association between personality and depression among Chinese older people aged 60 and above. Given the widely discovered gender differences in both personality and depression, the present study also aims to examine whether the association differs between males and females.

1.1. Relationship between personality and depression

Previous studies have identified a reciprocal relationship between personality traits and psychological well-being (Joshanloo, 2023; Klein

* Corresponding author.
E-mail address: jiali@cuhk.edu.hk (J. Li).

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et al., 2011). Many studies have investigated the role of personality traits in shaping depression. Potential pathways include social skills (Tse et al., 2011), vulnerability to stress (Klein et al., 2011), rumination (Chen et al., 2020), and attitudes towards aging (Bedaso and Han, 2021). Each of the five personality traits has differential and inconsistent contributory roles in depression. Generally speaking, the evidence regarding neuroticism and depression is relatively more consistent. Several meta-analyses have found that neuroticism was the most consistent predictor of depression, with higher levels of neuroticism being associated with higher levels of depressive symptoms or relapse of major depressive disorder (MDD) (Altaweel et al., 2023; Bucher et al., 2019). Another meta-analysis based on 243 studies also found that neuroticism was positively related to depression, while extraversion, openness, and conscientiousness were negatively associated with depression (Chavoshi, 2022). Compared to younger groups, a relatively smaller number of studies have specifically examined personality and depression among older people. As exceptions, a study among Japanese older people aged 65 and above has found that similar to other age groups, higher neuroticism, low extraversion, and agreeableness were associated with more depressive symptoms (Harada et al., 2022). Studies among older adults in the Netherlands aged 60 and above found similar results (Koorevaar et al., 2013; Koorevaar et al., 2017).

On the other hand, despite the common belief that personality traits tend to remain stable over time, studies have found that personality traits are susceptible to changes in one's life. Specifically, a meta-analysis of 22 studies (Debast et al., 2014) discovered a general trend of decreased neuroticism, openness, extraversion, and an increase in agreeableness and conscientiousness. Noordhof et al. (2018) suggested that depressed people may alter their self-reported personality due to demoralization. As pointed out by Joshanloo (2023), changes in psychological well-being may cause changes in daily thoughts, feelings, and behaviors, and thus cause changes over time in personality traits.

1.2. A network approach to understanding depressive symptoms and personality traits

Though the connection between Big Five personality traits and depression is intricate and diverse, prior studies have mainly explored the link between the five personality traits as a whole and depression symptoms rather than the connection between individual symptoms. As personality traits and depression are both linked to negative emotions and emotional instability, there is some overlap between the measures of personality traits, especially neuroticism and depression. This overlap may result in exaggerated correlations between them (Jones et al., 2021). Moreover, recent studies have pointed out that individual symptoms may be related to risk factors differently (e.g., Beevers et al., 2019; Liu et al., 2022).

The method of network analysis has been increasingly adopted to examine the network structure of multiple depressive symptoms and their relationships with various factors, such as inflammation (Fried et al., 2020), problematic Internet use (Cai et al., 2022), and substance use (Wasil et al., 2020). A network approach can help address the complex interrelationships between different symptoms and identify the most central symptoms or variables that are most strongly associated with depression. Investigating the reciprocal relationship between personality traits and depression can be helpful for practitioners to identify vulnerable subgroups within the older population and develop targeted interventions to address personality traits as a means of preventing or treating depressive symptoms.

1.3. Exploration of gender differences in personality-depression link

Research has shown that depression and personality traits differ between genders. Females typically report higher levels of neuroticism, agreeableness, and openness compared to males, consistent across different age groups (Chapman et al., 2007). These gender differences in personality traits are more pronounced in European and American cultures and may be influenced by socio-cultural and biological factors (Costa Jr et al., 2001). Similarly, females tend to report higher levels of depression than males due to various factors such as adverse childhood experiences, gender inequalities, and coping mechanisms (Hyde and Mezulis, 2020). However, there is a lack of understanding about potential gender differences in the centrality of depressive symptoms and the relationships between different personality traits and depression.

1.4. The present study

China has the largest number of older people aged 60 and above in the world. According to a recent systematic review and meta-analysis study, the overall prevalence of depressive symptoms among older Chinese people is 20.0 % (95 % CI, 17.5 %–22.8 %) (Tang et al., 2021). While many studies have explored the contributing factors of depression among older Chinese people (e.g., Chen et al., 2012; Cui et al., 2022), less is known about the role of personality traits. An exception is a study of Chinese older adults that found significant associations between neuroticism, agreeableness, and conscientiousness with depressive symptoms (Gong et al., 2020). However, the authors of this study treated personality and depression as two separate constructs with overall scores. As mentioned earlier, a network approach can address the conceptual and methodological overlap between these two constructs and investigate the detailed relationship between individual symptoms. To fill the research gaps, this study aims to examine (1) the network structure of depressive symptoms among Chinese older people; (2) the relationship between personality traits and depressive symptoms in a network structure; and (3) gender differences in these interconnections. As the study is exploratory, no specific hypotheses were set.

2. Methods

2.1. Samples and sampling

The 2018 wave of the China Family Panel Studies (CFPS) was used for the study. The CFPS is a nationally representative sample of the Chinese population conducted by the Institute of Social Science Survey (ISS) at Peking University, China, to collect individual-, family-, and community-level longitudinal data in 25 provinces or administrative equivalents representing 94.5 % of the total population in China (Xinjiang, Tibet, Qinghai, Inner Mongolia, Ningxia, Hainan, Hong Kong, Macao, and Taiwan excluded) (Xie and Hu, 2014). CFPS adopts a multistage probability sampling method; both adult and child samples were included within a household (Xie and Hu, 2014). The 2018 wave was adopted due to its inclusion of measurements for personality traits. Among the 9787 respondents aged 60 or above in this wave, one participant per household was randomly selected using the *slice_sample()* function in R (RStudio Team, 2020) to eliminate the impact of non-independence. After excluding cases with incomplete information on the key variables, including personality traits and depressive symptoms, 4876 participants were included in the analysis.

2.2. Measurement

Depressive symptoms include eight symptoms indicated by the 8-item version of the Center for Epidemiological Studies-Depression Scale (CESD-8), which is a brief, easy-to-administer self-report and validated measure used to assess depressive symptoms. Respondents are asked to indicate how much of the time during the past week they have experienced specific symptoms, such as feeling depressed or unable to get going. Each item is rated on a 4-point scale, ranging from 0 (none or almost none of the time) to 3 (all or almost all of the time). The eight items on the CESD-8 assess a range of depressive symptoms, including negative affect (e.g., feeling sad, lonely), somatic symptoms (e.g., restless sleep), and lack of positive affect (e.g., inability to enjoy life). CESD-

8 is one of the most adopted measures for depression screening in large-scale surveys among older people (Karim et al., 2015). It is advantageous due to its brevity, accessibility, and ease of use by non-mental health professionals in non-clinical settings, and it has shown sufficient reliability and validity similar to longer scales (Karim et al., 2015). It has been widely used in the Chinese context and has been validated as a useful and reliable tool to screen the risks of depression among the older population for further diagnosis (Bi et al., 2023; Liu et al., 2023). The Cronbach's Alpha of CESD-8 is 0.79 in this study, indicating a good internal consistency.

Personality traits were measured by the Chinese version of the Big Five Inventory (BFI)-15, which consists of 15 items, with three items measuring one trait of the five dimensions: extraversion, neuroticism, openness, agreeableness, and conscientiousness. The answers range from 1(totally inapplicable) to 5 (totally applicable). To make the interpretation of the results easier, we reverse-coded four items, including "*remain calm in tense situations*", "*tend to be lazy*", "*reserved*", and "*rude to others*", so that a higher level of each item represents a higher level of the respective personality facet. BFI-15 is a shortened version of the original 44-item inventory and was originally developed by Gerlitz and Schupp (2005) for the German Socio-Economic Panel Study (GSOEP). It was adopted by other large-scale surveys across the world, such as the Panel Study of Income Dynamics (PSID) in the US, the Swiss Household Panel (SHP), and the British Household Panel Survey (BHPS). It has shown sufficient reliability and validity as a rather brief tool to measure five personality traits (Hahn et al., 2012). BFI-15 has also been widely used among Chinese older adults (Wang et al., 2023; Xing et al., 2020). Using a diverse Chinese sample to evaluate the reliability and validity of BFI-15, Wu et al. (2023) pointed out that despite the low internal consistency, it is considered to be acceptable due to the small number of items for each subscale measuring broad constructs and the inclusion of reverse-worded items. More importantly, the scale is satisfactory in terms of test-retest reliability, correlations with longer personality scales and external criterion validity.

Covariates include age (in years), gender (male vs. female), government household registration system ("*hukou*": agricultural vs. non-agricultural), education (1 = illiterate/semi-illiterate; 2 = primary and middle school; 3 = high school and above), marriage (married/co-habited vs. non-married/divorced/widowed), and self-rated health (1–5, higher the score, better health).

2.3. Data analysis

Descriptive statistics was first performed to examine the sample characteristics. We also conducted a Wilcoxon signed-rank test to examine the gender differences in terms of personality traits and depressive symptoms. Subsequently, a series of network analyses were performed. We first estimated the network model among the eight depressive symptoms to identify the most central symptoms. The nodes in this network were the eight depressive symptoms, while the edges represented the relationships between them. Partial correlations were calculated to determine the edges. The thickness of the edges represented the association's magnitude, and nodes with stronger average associations were placed closer to the center of the graph. Expected influence (EI), which is the sum of a node's connections, was used as the centrality measure. Nodes with higher EIs were considered influential in the network. Compared to other centrality measures such as strength, betweenness, and closeness, EI is a more accurate indicator of centrality when there are negative correlations in the network (Robinaugh et al., 2016). In addition, a network analysis was performed with depressive symptoms and personality traits in the same network. The nodes in the network were the five personality traits and the eight depressive symptoms. Bridge expected influence (BEI) was calculated to identify the key nodes that connected the two different communities (depressive symptoms and personality traits) within the network. Compared with other bridge centrality measures such as bridge strength, betweenness, and closeness, BEI has been identified as a robust measure for bridge symptom identification (Jones et al., 2021). Nodes with higher BEI are considered "bridge" notes that connect different parts of the network.

A regularized Graphical Gaussian Model via the graphical lasso (*glasso*) was used to estimate the network models, and the *bootnet* package in R was used for the estimation and visualization of networks via the EBIC glasso algorithm (Epskamp et al., 2018). A case-dropping subset bootstrapping method was used to test the network's accuracy and stability by investigating the stability of centrality indices based on varying sub-samples. The stability of centrality indices was quantified using the correlation stability (CS) coefficient, with a value >0.5 considered stable (Epskamp et al., 2018). To examine potential gender differences, the *NetworkComparsionTest* package in R was used to perform a Network Comparison Test (NCT) (van Borkulo et al., 2015). The global network strength, network structure, and edge-wise difference were tested. Significant differences in global strength difference suggest that the overall strength of the nodes in the network is significantly different between the two groups. Significant differences in network structure between the two groups indicated that the network was not invariant. Significant differences in edge strength suggested that specific edges in the network differed significantly between the two groups. A p-value <0.05 was considered statistically significant.

3. Results

3.1. Sample characteristics

Table 1 presents the sample characteristics (N = 4876). The sample had a mean age of 68.30 (SD = 6.54). Females accounted for 48.87 % of the sample, and 70.53 % held an agricultural hukou. The majority of participants (88.35 %) had an educational level lower than high school, and 75.51 % were married or cohabiting with a spouse. The average self-rated health level was 3.5 (SD = 1.24) on a scale of 1 (very bad) to 5 (very good).

3.2. Network structure of depressive symptoms

We first tested the network structure of the eight depressive symptoms. As shown in Fig. 1(a), the strongest edges in the network included "lack of enjoyment-lack of happiness", "sadness-inability to get going", "loneliness-sadness", and "depressed mood-everything was an effort". As shown in Fig. 1(b), expected influence (EI) revealed that "*sadness*" (dp7) and "*depressed mood*" (dp1) were the most influential symptoms in the network, followed by "*lack of happiness*" and "*lack of enjoyment*", while "*restless sleep*" (dp3) was the least influential symptom.

The bootstrapped difference tests for EIs indicated that the two central nodes ("*sadness*" and "*depressed mood*") were significantly different from all other nodes, thereby indicating the robustness of the

Table 1
Sample socio-demographic characteristics (N = 4876).

Socio-demographic variables	Mean (SD); n (%)
Age	68.30 (6.54)
Gender	
Female	2383 (48.87 %)
Male	2493 (51.13 %)
Hukou	
Agricultural	3439 (70.53 %)
Non-agricultural	1437 (29.47 %)
Highest educational degree	
Illiterate/semi-illiterate	2303 (47.23 %)
Primary school and middle school	2005 (41.12 %)
High school and above	568 (11.65 %)
Marriage	
Married/co-habited	3682 (75.51 %)
Non-married/divorced/widowed	1194(24.49 %)
Self-rated health status	3.50(1.24)

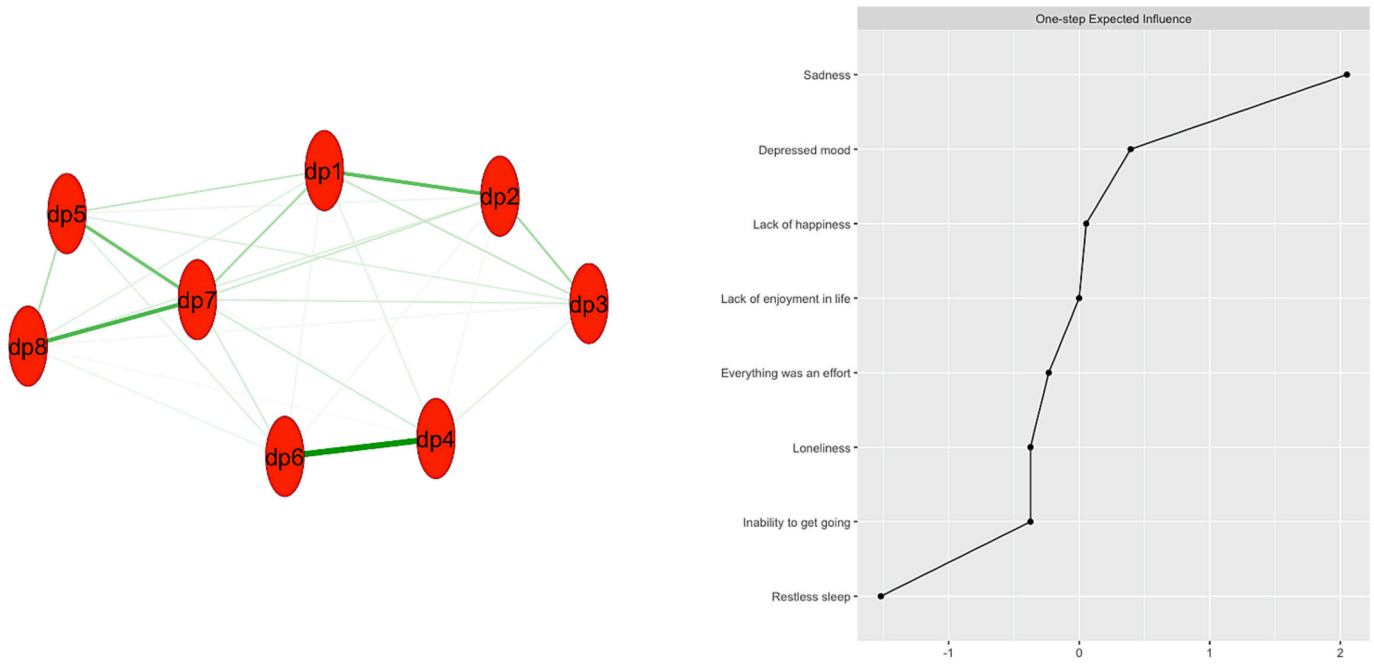

Fig. 1. Network structure of depressive symptoms (1a) and expected influence (EI) of each symptom (1b).
Note. (1a) Circles indicate nodes (CESD-8 item) and lines indicate edges (associations between two symptoms). Green connections indicate positive correlations. The thickness of lines represents the weights of the edges. (1b) x-axis shown as standardized z-score values. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

primary results. In contrast, "*restless sleep*" has an EI lower than all seven other symptoms (Fig. S1). The CS-coefficient of centrality EI, calculated using the case-dropping bootstrap method, was 0.75, indicating that the network remained stable after dropping 75 % of the sample (Fig. S2). The bootstrapped 95 % CIs of edges were narrow, indicating the accuracy of the observed network model (Fig. S3).

3.3. Network structure of depressive symptoms and personality traits

Fig. 2(a) displays the estimated network model of personality traits and depressive symptoms. There were 253 edges in total, and 153 (62.45 %) had non-zero weights. "*Worry a lot*" (nr1) and "*get nervous easily*" (nr2) were most strongly correlated with "*depressed mood*" (dp1) as a depressive symptom, and "*original*" (op1) and "(R)*reserved*" (ex3) as two personality facets, respectively. As shown in Fig. 2(b), among the facets of personality traits, two neuroticism facets, "*worry a lot*" (nr1) and "*get nervous easily*" (nr2), had the largest bridge EI.

The bootstrapped difference tests suggested that the bridge EIs of the two bridging nodes ("*worry a lot*" and "*get nervous easily*") were significantly higher than most other nodes, indicating the robustness of the

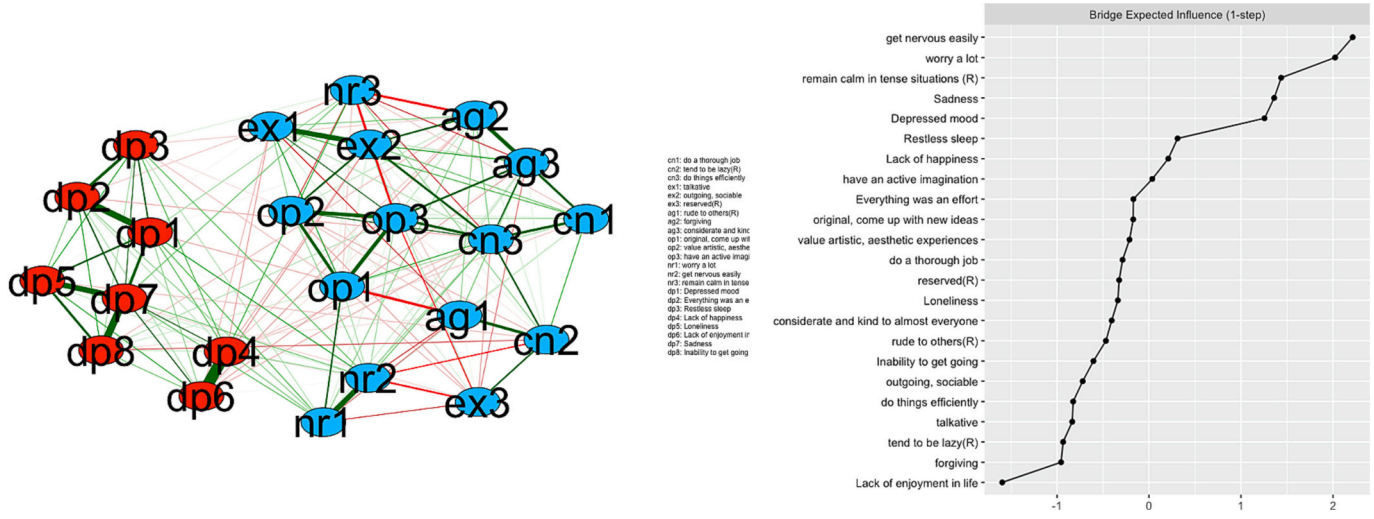

Fig. 2. Estimated network model of depressive symptoms and personality facets.
Note. Blue circles are nodes for personality traits and red circles are nodes for depressive symptoms. Green connections indicate positive correlations; red, negative correlations; thickness of lines is proportional to the strength of the correlation. *cn1:do a thorough job; cn2:tend to be lazy (R); cn3:do things efficiently; ex1:talkative; ex2: outgoing, sociable; ex3:reserved (R); ag1:rude to others (R); ag2:forgiving; ag3:considerate and kind to almost everyone; op1:original, come up with new ideas; op2:value artistic, aesthetic experiences; op3:have an active imagination; nr1:worry a lot;nr2:get nervous easily; nr3:remain calm in tense situations (R); dp1:depressed mood; dp2: everything was an effort; dp3:restless sleep; dp4:lack of happiness; dp5:loneliness; dp6:lack of enjoyment; dp7:sadness; dp8:inability to get going. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)*

primary results. "*Remain calm in tense situations (R)*" (nr3) played the third most important connecting role, and the bridge EI was significantly lower than the other two facets of neuroticism (Fig. S4). The CS-coefficient of bridge EI calculated by the case dropping bootstrap method was 0.75, indicating that the network remained stable after dropping 75 % of the sample (Fig. 3). The bootstrapped 95 % CIs of edges were narrow, indicating the accuracy of the observed network model (Fig. S5).

3.4. Gender differences

To examine the gender difference in the network model of personality traits and depression, we first compared the mean score of each item between males and females (Table 2). In general, the female sample reported significantly higher scores in neuroticism, extraversion, as well as depressive symptoms ($ps < 0.001$). Regarding the network structure of depressive symptoms, there was no significant gender difference based on the network invariance test and global strength invariance test ($ps = 0.103$ & 0.248). This indicated that the network of depressive symptoms was invariant across genders. Regarding the network structure of personality traits and depressive symptoms, there was a significant gender difference in the network invariance test ($p = 0.007$), indicating that the network structure was not invariant across genders. The male sample had a higher global strength than the female sample (9.238 vs. 8.372, $p = 0.028$). However, we did not detect significant edge-weight differences between personality traits and depressive symptoms as two communities. All the edge-weight differences are within the personality community: rude(*R*)-worried, original-worried, and forgiving-nervous. In general, the weights were higher among males than females (Table S1). The visualization of the networks for the two genders is shown in Figs. S6-S7.

3.5. Sensitivity analysis

Finally, we conducted a sensitivity analysis of the network analysis mentioned above by adding covariates (age, gender, hukou, education, marital status, and self-rated health) to the model to control their confounding effects (Pourhoseingholi et al., 2012). Of the 406 nodes, 238 (58.6 %) had non-zero weights. After adding the covariates, the network of depressive symptoms remained similar. The central symptoms were still "*sadness*" and "*depressed mood*", and "*restless sleep*" remained the least central (Fig. S8). Regarding the relationship between personality traits and depressive symptoms, items from neuroticism remained the most connected personality facets (Fig. S9). We also examined gender differences after adding other covariates. The personality-depression network remained variant across the two gender groups ($p = 0.041$). The three edges ((R)Rude – worried, forgiving – nervous, original – worried) showed similar patterns of gender differences (Table S2).

4. Discussion

The study is among the first to adopt a network approach with a large sample size to test the interrelationship between individual symptoms of depression and personality traits among older Chinese people. The findings suggested that "*sadness*", "*depressed mood*", "*lack of enjoyment*", and "*lack of happiness*" were the central symptoms of depression. Neurotic facets, namely "*worry a lot*" and "*get nervous easily*", play the most crucial role in connecting personality and depressive symptoms. Such results are accurate and stable and remain robust after adding covariates, including gender, into the networks. There were no significant gender differences in the edge weights between personality traits and depressive symptoms as two communities.

4.1. Central symptoms of depression

The centrality of "*sadness*", "*depressed mood*", "*lack of enjoyment*", and "*lack of happiness*" in the network of depressive symptoms is consistent with the mainstream findings from previous studies (e.g., Santos et al., 2017; Santos Jr et al., 2018; Wichers et al., 2021). For instance, a recent narrative review of network analysis suggested that sadness, depressed mood and anhedonia (inability to experience pleasure) are consistently found as the most central items in past network analysis (Wichers et al., 2021). On the other hand, restless sleep, compared with all other symptoms, is the least central in the network, which is consistent with other studies, such as one among the Chinese population (Zhao et al., 2021) and another one among HK residents during the pandemic (Cheung et al., 2021). However, both studies under-represented the older population; the HK study excluded those aged 60 and above. Our study is consistent with a large-scale European population study with samples of adults aged 50 and above from 19 European countries and Israel, finding that sleep problems were situated peripherally in the network of depressive symptoms. One tentative explanation offered by the authors was that sleeping problems might be caused by multiple reasons beyond depression, such as physical illness. Therefore, the role

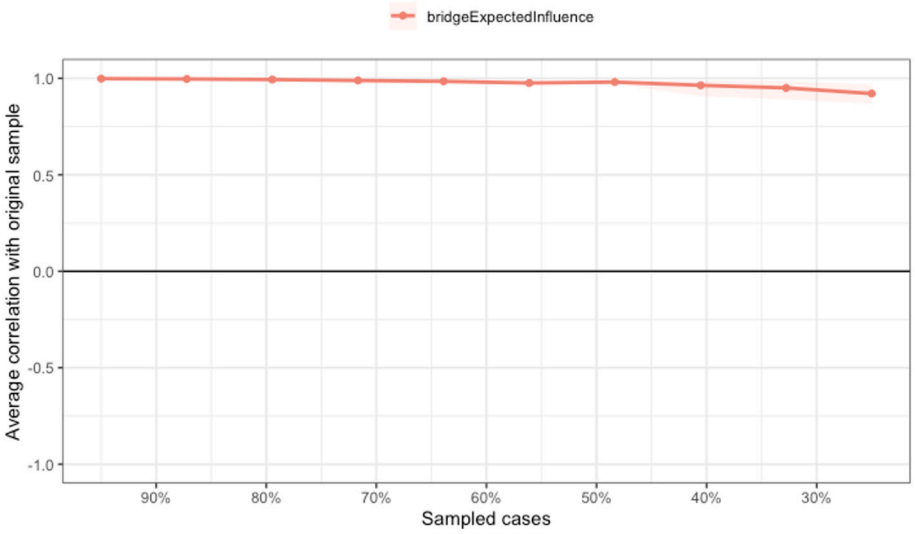

Fig. 3. Stability of bridge expected influence(BEI) by case dropping subset bootstrap.
Note. The x-axis represents the percentage of cases in the original sample used at each step. The y-axis represents the average of correlations between the centrality indices in the original network and the centrality indices in the networks that were re-estimated after dropping increasing percentages of cases.

Table 2
Mean scores (SD) of personality traits and depressive symptoms by gender.

Statement	Overall N = 4876	Female N = 2383	Male N = 2493	p^*
Conscientiousness				
Do a thorough job	4.20 (0.77)	4.18 (0.77)	4.23 (0.76)	0.025
Tend to be lazy (R)	3.79 (1.24)	3.83 (1.24)	3.78 (1.23)	0.11
Do things efficiently	3.83 (1.00)	3.79 (1.02)	3.84 (0.97)	0.3
Extraversion				
Talkative	3.59 (1.15)	3.64 (1.13)	3.52 (1.15)	<0.001
Outgoing, sociable	3.78 (1.05)	3.80 (1.06)	3.77 (1.05)	0.14
Reserved (R)	2.93 (1.24)	2.83 (1.24)	3.02 (1.23)	<0.001
Agreeableness				
Rude to others (R)	3.48 (1.26)	3.59 (1.25)	3.42 (1.26)	<0.001
Forgiving	4.10 (0.80)	4.12 (0.82)	4.07 (0.82)	0.014
Considerate and kind to almost everyone	4.10 (0.83)	4.15 (0.81)	4.05 (0.85)	<0.001
Openness				
Original, come up with new ideas	2.91 (1.26)	2.81 (1.27)	3.02 (1.24)	<0.001
Value artistic, aesthetic experiences	2.97 (1.29)	2.91 (1.32)	3.04 (1.26)	<0.001
Have an active imagination	3.28 (1.19)	3.25 (1.21)	3.35 (1.17)	0.005
Neuroticism				
Worry a lot	3.40 (1.26)	3.54 (1.24)	3.27 (1.28)	<0.001
Get nervous easily	3.01 (1.28)	3.18 (1.28)	2.83 (1.25)	<0.001
Remain calm in tense situations (R)	2.32 (1.03)	2.38 (1.07)	2.25 (0.98)	<0.001
Depression				
Depressed mood	1.75 (0.84)	1.84 (0.88)	1.67 (0.79)	<0.001
Everything was an effort	1.93 (0.99)	2.03 (1.00)	1.85 (0.96)	<0.001
Restless sleep	1.96 (1.04)	2.17 (1.07)	1.74 (0.96)	<0.001
Lack of happiness	2.05 (0.99)	2.10 (1.00)	2.00 (0.98)	<0.001
Loneliness	1.56 (0.88)	1.61 (0.90)	1.48 (0.82)	<0.001
Lack of enjoyment in life	1.91 (0.95)	1.93 (0.96)	1.88 (0.95)	0.039
Sadness	1.55 (0.80)	1.67 (0.86)	1.43 (0.73)	<0.001
Inability to get going	1.29 (0.67)	1.34 (0.73)	1.24 (0.61)	<0.001

Note. * *p*-value from Wilcoxon signed-rank test.

of sleep problems may not be central in the network (Belvederi Murri et al., 2020).

4.2. The bridging role of neuroticism

Neuroticism, among five personality traits, has the highest interconnection with depressive symptoms, especially "*depressed mood*". It is consistent with previous studies suggesting that neuroticism has a more profound relationship to depression than other personality traits (Olawa and Idemudia, 2020; O'shea et al., 2017). "*Worry a lot*" and "*Get nervous easily*" play particularly critical connecting roles. Neuroticism features greater intolerance for uncertainty and increased worry and nervousness can cause mental health disorders, including depressive symptoms over time (Arend et al., 2023; Chen et al., 2020). "Worry" is defined as "*a chain of repetitive and uncontrollable thoughts and images focused on possible future negative outcomes and the consequences of these*" (Borkovec, 1994, cited by Joubert et al., 2022: 930). It is a variant of repetitive negative thinking, which is identified as a core underlying mechanism for depression (Joubert et al., 2022). The tendency to get nervous has also been found to be closely related to worry; as a symptom of generalized anxiety disorder, frequent nervousness has been found to be a key linkage item between anxiety and depression (Park and Kim, 2020). On the other hand, neuroticism may play a bridging role in connecting the reciprocal relationship between depression and other personality traits, such as extraversion and openness. Depressive people may experience neurotic symptoms such as more worry and nervousness and hence tend to influence other personality traits such as being more reserved and refraining from social engagement.

4.3. Limitations and suggestions

This study carries some limitations. First, the sample of this study is specific, and the findings may not be generalizable to other population groups, especially younger or older groups from other countries. Second, the exploratory nature of a network analysis limits its capability to draw a causal relationship; there is also a chance that a third variable that is not included in this study can influence the network. Thirdly, this study uses cross-sectional data, which precludes the identification of temporal patterns in the depression network and its relationship with personality traits. Future studies should use longitudinal datasets to examine potential changes in personality-depression relationships over time. Additionally, this study did not address specific events that are closely linked to the onset and development of depressive symptoms among the older population, such as disability and widowhood. Future studies should use longitudinal data to track the sustainability and changes in the personality-depression network over time. Last but not least, CESD-8, despite being a proven reliable and valid tool for depression screening, could not cover all the potential symptoms for depression diagnosis as set by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR). Future studies could adopt a fuller list of depressive symptoms to examine the relationship between personality and depression further.

4.4. Implication for future practice and policy

Despite its limitations, as one of the first to explore the link between personality traits and depressive symptoms among older people, this study offers valuable insights for the identification and prevention of older Chinese people's depression. First, mental health and elderly care professionals may prioritize emotional problems rather than somatic symptoms in the identification and prevention of older people's depressive symptoms. Screening tools and diagnostic interviews could be more sensitive to detect the severity of sadness and depressed mood. The central role of emotional symptoms also calls for more efforts to enhance emotional resilience among Chinese older people to foster positive affect. Second, the critical bridging role of neuroticism between personality and depression suggests that older people with high levels of neuroticism may be at a greater risk of developing depressive disorders. Awareness of this relationship necessitates a proactive approach among health and social care professionals to recognize early signs of depressive symptoms in clients who exhibit neurotic characteristics. Older individuals with high neuroticism may experience a heightened response to the stressors associated with aging, such as loss of independence, bereavement, and chronic health issues, which can precipitate or worsen depressive symptoms. Third, the salience of neurotic characteristics, namely the tendency to feel worried and nervous, calls for more practitioners and policymakers to mitigate the issues that may cause worries and nervousness among the older Chinese population. Future care arrangements are a major source of worry and uncertainty among older Chinese people (Bai et al., 2020). A recent study has shown pessimistic attitudes and a low level of trust among older Chinese people

in the healthcare system, especially those with a lower subjective social status and upward mobility (Chen and Cheng, 2022). Promoting accessible and affordable health care may effectively ease their worry and nervousness, and therefore increase the emotional resilience of neurotic older people to prevent the onset and progression of depression.

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Declaration of competing interest

The authors declare no conflict of interest for this paper.

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Appendix A. Supplementary data

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