Research article

The structural characteristics and influential factors of psychological stress of urban residents in Jiangxi province during the COVID-19 pandemic: cross sectional study

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ARTICLE INFO

ABSTRACT

Aims: To explore the structural characteristics and influential factors of psychological stress of urban residents in Jiangxi province during the COVID-19 pandemic through a survey of psychological stress, personality traits, family function and life satisfaction.

Methods: By the convenient sampling, 1422 urban residents from Jiangxi province were assessed with Eysenck Personality Questionnaire Short Scale (EPQ-RSC), Psychological Questionnaires for Emergent Events of Public Health (PQEEPH), Family APGAR Scale (APGAR) and Satisfaction With Life Scale (SWLS). The relation among personality traits, psychological stress, family function and life satisfaction during the COVID-19 pandemic was analyzed by using the canonical correlation analysis and the serial mediation model.

Results: (1) Among the estimated correlation coefficients, the first two pairs were significant ($P < 0.001$ in each). (2) In the first pair of canonical variables, the loadings of neuroticism and neurasthenia were the higher (0.94, 0.70). (3) Neuroticism and life satisfaction mediated the relationship between family function and neurasthenia ($\beta_{neuroticism}$ = -0.174; 95%CI:-0.224, -0.134; $\beta_{life\ satisfaction}$ = -0.034, 95%CI:-0.012, -0.062), respectively. In addition, serial mediation analyses indicated that the association of family function and neurasthenia is mediated by neuroticism and life satisfaction in a sequential manner (β = -0.010; 95%CI:-0.020, -0.004).

Conclusions: During the COVID-19 pandemic, neuroticism was closely related to psychological stress of urban residents, especially neurasthenia. In addition, the serial mediating effect of neuroticism and life satisfaction played an important role in the process of family function influencing neurasthenia. These findings contributed to a more comprehensive understanding of the influential factors for psychological stress of urban residents during the COVID-19 pandemic.

1. Introduction

The COVID-19 outbreak spread rapidly in late January 2020 and aroused enormous attention globally. The COVID-19 pandemic quickly caused public anxiety and panic due to the suddenness, urgency, seriousness, high uncertainty and social hazard (Kobi et al., 2021; Spyridon et al., 2021). Given the above characteristics of the COVID-19, as the neighboring province of Hubei, the urban residents of Jiangxi province also need to be concerned. Jangxi province was hit by a wave of the

COVID-19 pandemic from the beginning of last year, which brought a great loss to the life and produce of local residents (Li et al., 2021). The main reasons for urban residents to commute on a daily basis are not only just for work but also for study, business, shopping and their social life. To limit the impact of the COVID-19 pandemic, home quarantine at the request of governments dramatically changed the lives of urban residents, prohibitions on non-essential activities outside the home, school closures, and working at home forced millions to modify their daily routines at very short notice (Lou et al., 2020). In addition, from the

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perspective of urban spatial pattern and urban form, the urban spatial agglomeration, polarization of urban spatial pattern, and the concept of centralized urban spatial planning is the objective conditions for the spread of the epidemic and the aggravation of its impact (Pan, 2020). If people lived in urban city during the COVID-19 pandemic, they will become more prone to emotional issues, mood swings and depression (Escola-Gascon et al., 2021). So physical and psychological health of urban residents are more worthy of our attention. In this period, it is urgent to quickly screen out urban residents with high -risk mental disorders and develop targeted psychological interventions.

Personality traits are unique organization formed by individuals in the process of socialization, which is closely related to psychological stress (Urquijo et al., 2016; Ning et al., 2018). Studies have shown that neuroticism is an important predictor of psychological stress (Hanley et al., 2019; He et al., 2019). Psychoticism had a medium negative correlation with psychological stress (Lawrence et al., 2017). And extroversion was also a protective factor for mental health (Newton-Howes et al., 2015). Therefore, urban residents with different personality traits may be affected differently in the psychological stress during the COVID-19 pandemic. It will make us better to understand the structural characteristics of this relation by discussing and analyzing the relationship between personality traits and psychological stress. There were two kinds of models of the influence of personality traits on mental illness: classical models and dynamic models. Classical models included Predisposition model and Pathoplasticity model, which assumed that personality traits are important cause of mental illness, Predisposition model also assumed that other moderating or mediating risk factors interacted to influence the relationship between personality traits and mental illness (Li et al., 2019). However, Classical models didn't consider the influence of physiological factors and environmental factors. So Dynamic models began to be proposed and favored by researchers (Kendler et al., 2004; Howe et al., 2016). Actually, Dynamic models extended Classical models to emphasize the interaction of personality traits with risk factors (Middeldorp et al., 2008; Spinhoven et al., 2011).

Therefore, with these two models, the influence that other factors put on it could not be neglected in the underlying mechanism. Family function theory (Miller et al., 2010; Skinner et al., 2010) assumed that the normal operation of basic family functions can promote the development of urban residents' mental health and strengthen the internal emotional links of family members. Some surveys also have found urban residents who were accepting medical observation cannot be with their family members, that might bring up anxiety, frustration and feel out of control (Weinstein and Nguyen, 2020). On the contrary, if home quarantine made family members have more chances to spend time with each other, in the process, the empathy and support from family members will buffer the negative impact of mental health from quarantine and lockdown (Pan et al., 2021), so family function could come into play during the period. Moreover, some researches have found that the severity of the COVID-19 pandemic in urban residents' home city predicted their life satisfaction, and as urban residents' life satisfaction declining, they were more likely to have psychological problems (Zhang et al., 2020). Therefore, family function and life satisfaction could also be part of this mechanism.

The previous studies have focused on the relation between personality traits and psychological stress of different groups in the normal period (Remlein et al., 2015), but few studied the relationship between personality traits and psychological stress during the COVID-19 pandemic. Based on classic models and dynamic models, we aim at exploring the relation between personality traits and psychological stress, and on the basis of confirming their internal structure, further identify the maximum load factor in each comprehensive variable and construct a serial mediation model to investigate the specific underlying mechanism. We want our research outcomes to be used to provide a theoretical basis for monitoring high-risk groups of psychological problems and taking special psychological intervention. According to this logic, our study presented two hypotheses (Figure 1):

Hypothesis 1. The maximum load factor in personality traits and the maximum load factor in psychological stress could explain the relation between personality traits and psychological stress.

Hypothesis 2. Family function and life satisfaction could also play roles in this process.

2. Methods

2.1. Participants and procedure

The survey, conducted February 3 through March 1. We performed the online survey in the name of The Second Affiliated Hospital of Nanchang University. Questionnaires were distributed through Wenjuanxing which is a platform providing functions equivalent to Amazon Mechanical Turk. All of our QR codes of the questionnaire, were distributed through WeChat group chat in the urban communities, these measures can ensure that all of the participants in these analyses were Jiangxi province urban residents. After scanning the two-dimension code, they could fill in questionnaires. Our study followed the voluntary, anonymous and the principle of confidentiality to distribute the questionnaire in various cities' communities WeChat group chat. Meanwhile, we also considered age structure and living city of the urban population and tried our best to match all of these factors. In this study, a total of 1477 urban residents from the Jiangxi province in China took an online survey. After reviewing the submitted questionnaires, 1422 valid questionnaires were obtained, yielding a response rate of 96.27%. The high response rate may be due to the following reasons: first of all, our study was carried out in the form of hospital and community cooperation. With the cooperation of community staff, participants were more active. Second, our study was carried out during the COVID-19 pandemic, during which most areas of Jiangxi Province were shut down and controlled, most residents complied with the government order to hold in home quarantine. As a result, residents spent more time at home and had more leisure time to participate in the survey. Thirdly, our research not only included the assessment of the mental health status of urban residents, but also set up a psychological assistance team to provide psychological intervention for urban residents in need. Finally, after collecting the data, we performed quality control check, and used liar test questions to eliminate invalid questionnaires. Among those participants, 935 were female, accounting for 65.75%; the urban residents' mean age was 33.69 (SD = 13.18, range = 12–75). What needs to be emphasized is, we have used two methods to calculate the sample size. Firstly, the total number of items was used to estimate the sample size before the study. The total number of items in our scale is 83. Estimating the sample size at ten times the total number of items, the results have suggested that we need at least 1245 participants. Secondly, we have used Monte-Carlo Simulation to estimate the sample size. We set the path coefficient according to the results of previous studies and pre-survey. The results have shown that the statistical power of test of each path of the model exceeds 0.9 after the sample size reaches 1400. Using the two together calculate the sample size at 1400. The study was approved by Medical Research Ethics Committee of The Second Affiliated Hospital of Nanchang University and also obtained informed consent from the participants or their guardians. After informed of the research's voluntary nature, participants were sought to responses about demographic variables, family function, personality traits, life satisfaction, and psychological stress.

2.2. Research instruments

Overall, the following instruments were used for data collection: 1) Psychological Questionnaires for Emergent Events of Public Health; 2) Eysenck Personality Questionnaire-Revised Short Scale; 3) Family APGAR Scale; 4) Satisfaction With Life Scale.

2.2.1. Psychological stress

We assessed psychological stress with Psychological Questionnaires for Emergent Events of Public Health (PQEEPH) developed by Zhou et al. (2021). This questionnaire consists of 25 items of five subscales, depression, fear, neurasthenia, compulsion-anxiety, and hypochondria. Each item was scored according to the degree of emotional response (0 = "seldom" to 3 = "severe") and frequency (0 = "seldom" to 3 = "always"). The Cronbach alpha of the questionnaire for this assessment was 0.93. The Cronbach alpha of the five dimensions (depression, fear, neurasthenia, compulsion-anxiety, and hypochondria) was 0.90, 0.85, 0.79, 0.84, and 0.61, respectively.

2.2.2. Personality traits

We assessed personality traits with Eysenck Personality Questionnaire-Revised Short Scale (EPQ-RSC) developed by Qian et al. (2000). It contains four subscales with 12 items, including P mental quality scale, E extroversion scale, N nerve quality scale and L disguise scale. The total score of each dimension was divided by the number of items to get the score of that dimension. The Cronbach alpha of the revised scale: P scale 0.67, E scale 0.88, N scale 0.80, L scale 0.78.

2.2.3. Family function

We assessed family function with Family APGAR Scale (APGAR) developed by Zhang (2005). There are 5 items on the scale, with 1 items on each of five dimensions: fitness, cooperation, growth, emotion and intimacy. Participants rated their levels of family function on a 3-point Likert scale ranging from 0 (occasionally) to 2 (frequently). The sum of 5 items scores reflects the overall level of family function. The Cronbach alpha for this assessment was 0.87.

2.2.4. Life satisfaction

We assessed life satisfaction with Satisfaction With Life Scale (SWLS) developed by Diener et al. (1985). This scale consists of 5 items for which participants indicated the extent of their agreement on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The Cronbach alpha for this assessment was 0.87.

2.3. Statistical analysis

To avoid response bias, we made some preparations during the data collection phase. Firstly, we have prepared adequately before the study conducting. The instruments our study chose were all internationally used scales, which has good reliability and validity. And we have also set up three liar test questions in the questionnaire. Secondly, we did fully train our volunteers and made sure volunteers are ready to help participants and answer their questions. Moreover, volunteers also emphasized the purpose of the study and the strict confidentiality of its findings in the guidance to the questionnaire, and told participants that there was no right or wrong answer and that participants could respond according to their real situation. Finally, after the study was conducted, we carefully checked up the data. The data of the participants are considered to be useful only if they answer all of liar test questions correctly. To address potential sources of bias, first of all, our online platform had set up the questionnaire, which means that participants can submit the questionnaire successfully only after completing all the items. Second, we set up three liar test questions throughout the questionnaire. Only when all three polygraph questions are answered correctly will the participants' data be included in the analysis. Thirdly, we conducted unified online training for the volunteers who distributed QR codes in the WeChat chat group, so as to ensure that the volunteers in each group could timely answer the questions of the participants. Finally, we standardized the guidelines in the questionnaire, and explained the research purpose, re. All analyses in the present study were performed by using SPSS 25.0 and MPLUS 7.4. Firstly we used Harman's one factor analysis to conduct a common variance analysis for detecting common method bias, causing the data of this study were all from self-report questionnaires (Fuller et al., 2016). Secondly, descriptive statistics and correlation analysis were presented. Finally, we conducted a path analysis in MPLUS 7.4 to test the multiple mediation model. The probability of a two-sided test result (P) < 0.05 was considered statistically significant for all analyses. The reasons for using MPLUS 7.4 are as follows: on the one hand, MPLUS 7.4 has many default settings, while AMOS requires specific arrows to be drawn on the default Settings, which makes it difficult for AMOS and SMART PLS to create complex models. In terms of data processing function, AMOS must process the original data in advance before further analysis, such as limiting the calculation of a variable and grouping a group variable, etc. However, MPLUS 7.4 does not need to process the original data and can be processed directly in the software using syntax. It is the variable centralization in the analysis of the regulatory effect. In AMOS, the data of the original data file (SPSS or EXCEL) must be manually centralized in advance to generate centralized variables and interaction items. On the other hand, MPLUS 7.4 centralizes the syntax code directly by using the center command. According to our hypothesis, we have hoped to conduct a serial mediation model. Therefore, in combination of our hypothetical model, we believed that MPLUS 7.4 was more suitable for our study.

3. Results

3.1. Check for common method bias

The unrotated factor analysis results showed that 5 factors were generated and explained 66.54% of the total variation. The first principal factor explained only 33.25% of the variance, indicating that common method bias was not likely to be a significant problem in this study.
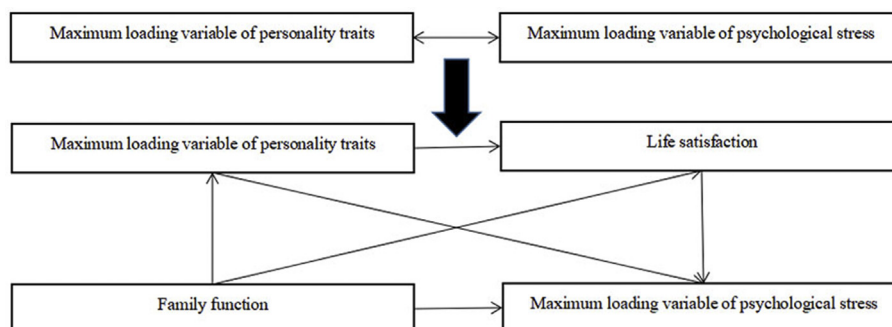

Figure 1. The hypothetical model.

3.2. Preliminary analysis

The correlation matrix for all study variables was presented in Table 1. Correlation analyses showed that psychoticism and neuroticism were positively associated with depression, neurasthenia, obsessive-anxiety and hypochondria. And, neuroticism was positively associated with fear. However, extroversion and lie were negatively correlated with all the dimensions of psychological stress. In addition, family function was positively associated with extroversion and lie, and family function was negatively associated with depression, neurasthenia, and obsessive-anxiety. Moreover, there was a positive association between life satisfaction and extroversion as well as family function. Life satisfaction was negatively associated with psychoticism, neuroticism, and all the dimensions of psychological stress.

3.3. Canonical correlation analysis of personality traits and psychological stress

Table 2 revealed that there were two significant canonical correlations (Rc = 0.63, Rc = 0.23). According to the square table of the canonical correlation coefficients, the first canonical correlation had strong explanatory power for the canonical correlations, and 39.69% of the information in psychological stress could be explained by personality traits. It indicated that the first canonical correlation coefficients were sufficient to express the correlation between the two sets of indicators (Figure 2). Therefore, this study selected the first canonical correlation to analyze the relationship between psychological stress and personality traits. For the independent set, the canonical variate was represented primarily by neuroticism, and the canonical variate for the dependent set was represented primarily by neurasthenia. The amount of variance in the independent set explained by the dependent set was 0.13, and the amount of variance in the dependent set explained by the independent set was 0.24. This analysis revealed that neuroticism, but not other dimension of personality traits, was positively related to neurasthenia while controlling for the intercorrelation among all variables. The sign of the canonical function coefficient of neuroticism and neurasthenia was consistent, which indicated that the higher neuroticism, the higher neurasthenia would be. Therefore, Hypothesis 1 was supported (see Table 2).

3.4. Testing for the proposed model

The results from canonical correlation analysis showed that neuroticism was strongly correlated with neurasthenia. To further explore this mechanism and test the relation among family function, life satisfaction, neuroticism, and neurasthenia, we conducted a path analysis in MPLUS 7.4. The proposed serial multiple mediation model (Figure 3) demonstrated sufficient goodness of fit to the data, *RMSEA* = 0.04, *SRMR* = 0.03, *NFI* = 0.98, *TLI* = 0.98. The results of path analysis (Figure 3) showed that family function positively predicted life satisfaction (β = 0.39, $P < 0.001$), and family function negatively predicted neuroticism (β = -0.32, $P < 0.001$). Neuroticism negatively predicted life satisfaction (β = -0.36, $P < 0.001$), and positively predicted neurasthenia (β = 0.54, $P < 0.001$). Moreover, life satisfaction negatively predicted neurasthenia (β = -0.09, $P < 0.01$). Finally, family function could not predict neurasthenia (β = -0.02, $P > 0.05$).

The bias-corrected bootstrap procedure was used to test the significance of mediating effects. The indirect effects were estimated from the 2000 samples developed by random assignment in the original data. The indirect effects would prove statistically significant if 95% bootstrap confidence intervals did not contain zero. The bootstrapping procedures indicated that both neuroticism and life satisfaction mediated the links between family function and neurasthenia significantly: (1)Neuroticism played a mediating role in the effect of family function on neurasthenia (*indirect effect* = -0.174; 95%CI: -0.224, -0.134, $P < 0.001$); (2) Life satisfaction played a mediating role in the effect of family function on neurasthenia (*indirect effect* = -0.034; 95%CI: -0.012, -0.062, $P < 0.001$); (3) Neuroticism and life satisfaction played a serial mediating role in the effect of family function on neurasthenia (*indirect effect* = -0.010; 95%CI: -0.020, -0.004, $P < 0.001$) (Table 3). Therefore, Hypothesis 2 was also supported.

4. Discussion

So far, there have been less reports on psychological stress of urban residents in response to public health emergencies caused by the outbreak of COVID-19. The purpose of this study was to find an entry point and a rallying point of effective psychological assistance by exploring the psychological stress and its influential factors of urban residents. By exploring the relation between personality traits and psychological stress, we hoped to find the most relevant factors from the two comprehensive variables, and constructed a serial mediation model on this basis. We first explored the relationship between personality traits and psychological stress by using canonical correlation analysis. The results from canonical correlation analysis found that personality traits can explain 24.05% of the psychological stress variability of urban residents during COVID-19 pandemic through the first canonical correlation. During the COVID-19 pandemic, the psychological stress variation of urban residents could explain 13.13% of the personality traits through the first canonical correlation. Because the interpretation rates were standardized data and can be directly compared, personality traits had a relatively large impact on the psychological stress of urban residents during the COVID-19 pandemic. From the results of canonical correlation analysis, it could be seen that the absolute value of the loading factor of neuroticism in the personality traits during the COVID-19 pandemic was the largest at 0.94, the absolute value of the loading factor of neurasthenia in the psychological stress was the most at 0.70, which prompted: neuroticism had a more significant role in explaining neurasthenia. Previous studies had also pointed out that high neuroticism scores would cause more psychological symptoms, which was also consistent with the results of our study (Adam et al., 2019; Lee and Kim, 2021). Eysenck's personality theory held that individuals with high neuroticism were often anxious, nervous, worried, emotionally fluctuating, having strong emotional responses to stimuli, and even acted irrational behaviors (Matthews and Gilliland, 1999). Many empirical studies have also supported the theory, it meant that neuroticism is strongly linked with psychopathology, particularly depression (Ormel et al., 2001; Kendler et al., 2006; Dunkley et al., 2009) and anxiety (Jorm et al., 2000; Hengartner et al., 2016). Furthermore, evidence has suggested that more neurotic individuals are at an increased risk of developing mental illnesses, such as anxiety and depression (Aldinger et al., 2014). Neuroticism of urban residents during the COVID-19 pandemic had a more prominent health effect, which might be related to the sudden emergence and uncertainty of the COVID-19 pandemic. Therefore, during the COVID-19 pandemic, urban residents often appeared nervous, flustered, overwhelmed, and so on (Bäuerle et al., 2020). It was due to a lack of prior psychological preparation, and they even had an excessive behavioral performance. The urban residents with high neuroticism were prone to emotional instability, self-centeredness, indifference, and Impulsivity (Irum et al., 2018). In the early days of the COVID-19 outbreak, the infection raged through the city, which might create further disquiet. The above factors aggravated the intensity of stress response to the COVID-19 pandemic in urban residents, and they were also more prone to have psychological stress problems, especially the symptoms of neurasthenia (Liu et al., 2020; Yao et al., 2020; Wu et al., 2021).

Our study showed that neuroticism was positively related to neurasthenia, and neuroticism was an important factor affecting psychological stress during the COVID-19 pandemic, which was in line with prior findings that neuroticism was casually related to some mental diseases (Tian et al., 2018; Patricia et al., 2020). Based on this conclusion, we also introduced other variables that may affect psychological stress of urban residents during the COVID-19 pandemic, the relationship and mediating

Table 1. Pearson correlation between personality traits and psychological stress.

Factors	1	2	3	4	5	6	7	8	9	10	11
Psychoticism	—	—	—	—	—	—	—	—	—	—	—
Extroversion	-0.16**	—	—	—	—	—	—	—	—	—	—
neuroticism	0.12**	-0.24***	—	—	—	—	—	—	—	—	—
Lie	-0.07*	0.07*	-0.40***	—	—	—	—	—	—	—	—
Depression	0.18***	-0.18***	0.54***	-0.25***	—	—	—	—	—	—	—
Neurasthenia	0.17***	-0.18***	0.61***	-0.26***	0.77***	—	—	—	—	—	—
Fear	-0.05	-0.07**	0.37***	-0.21***	0.45***	0.44***	—	—	—	—	—
Compulsion-Anxiety	0.20***	-0.12***	0.51***	-0.19***	0.71***	0.79***	0.49***	—	—	—	—
Hypochondria	0.05*	-0.06*	0.32***	-0.11***	0.41***	0.46***	0.54***	0.54***	—	—	—
Family function	-0.14***	0.21***	-0.25***	0.10***	-0.15***	-0.22***	-0.04	-012***	-0.02	—	—
Life satisfaction	-0.10***	0.25***	-0.41***	0.30***	-0.30***	-0.35***	-0.14***	-0.25***	-0.13***	0.43***	—

Note. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

Table 2. Canonical correlation analysis between personality traits and psychological stress.

Canonical correlations			Canonical variate			
			1	2	3	4
			0.63[a]	0.23[a]	0.09	0.04
Independent variables	M	SD				
Psychoticism	2.04	1.54	-0.14	**0.95**	0.17	-0.29
Extroversion	6.74	2.81	0.05	0.14	0.85	-0.59
Neuroticism	4.38	3.42	**-0.94**	-0.04	0.55	0.28
Lie	6.36	2.75	0.06	**0.40**	-0.56	0.84
Redundancy coefficient			0.13	0.01	<0.01	<0.01
Dependent variables	M	SD				
Depression	0.42	0.58	-0.26	0.15	-1.05	-0.54
Neurasthenia	0.38	0.56	**-0.70**	**-0.47**	-0.28	1.25
Fear	0.74	0.59	-0.13	**-1.07**	0.26	-0.57
Compulsion-Anxiety	0.18	0.37	-0.03	**1.06**	0.99	-1.01
Hypochondria	0.22	0.41	0.02	0.09	0.45	0.83
Redundancy coefficient			0.24	0.01	<0.01	<0.01

Note. The standardized canonical function coefficients (presented in each column below canonical correlations) are those used in the equation to combine the independent and dependent variables into two synthetic dimensions. These dimensions are then correlated to produce the canonical correlation. Thus, the standardized canonical function coefficients are interpreted as the relative contribution (i.e., weight) that each variable contributes to that independent or dependent canonical dimension. Values in bold represent statistically significant loadings for each canonical correlation.

[a] First Canonical Correlation, Second Canonical Correlation, $P < 0.001$.

effect among variables was tested by using structural equation model. Hypothesis model was tested using structural equation modeling method, whose result showed the effectiveness of the hypothesis model in integrating and treating survey data. The results showed that family function indirectly influenced neurasthenia via three pathways: neuroticism, life satisfaction, and the serial mediating effect of neuroticism and life

Figure 2. The relative structure of the first canonical correlation and the original variables (X1: Psychoticism, X2: Extroversion, X3: Neuroticism, X4: Lie; Y1: Depression, Y2: Neurasthenia, Y3: Fear, Y4: Compulsion-anxiety, Y5: Hypochondria).

satisfaction, which contributed to a deeper understanding of the mechanism between neuroticism and neurasthenia.

First of all, neuroticism played a mediating role in the relationship between family function and neurasthenia. This was partly in line with the previous finding reporting urban individual perceptions of the family function were linked to their neuroticism (Millikan et al., 2002). On the one hand, environmental factors played an important role in neuroticism (Wu et al., 2020), among them, family function was one of the factors influencing neuroticism. If atmosphere in the family environment where people lives was bad, family life will be filled with ambivalence and bittersweet. It could also lead to numerous family problems, including excessive family conflict, ineffective problem solving, lack of intimacy, and weak emotional bonding. Then the family conflicts would be beginning and family members would be mute, distant, and indifferent in this situation, they were also higher neuroticism (Ni et al., 2020; Dang et al., 2020). On the other hand, high neuroticism individuals had an obvious tendency of nervousness and emotional instability, and individuals with high neuroticism also experienced more negative effect and higher affective variability in their daily lives (Kroencke et al., 2020). Just like the assumption of Dynamic models, family was an external environment influencing the relationship between personality traits and
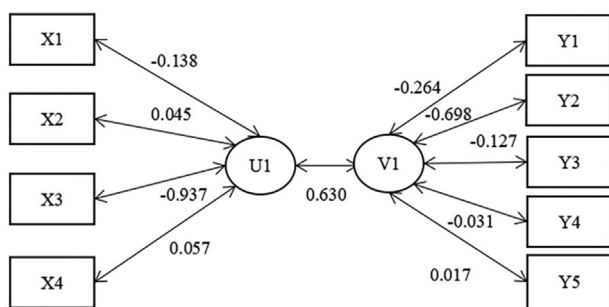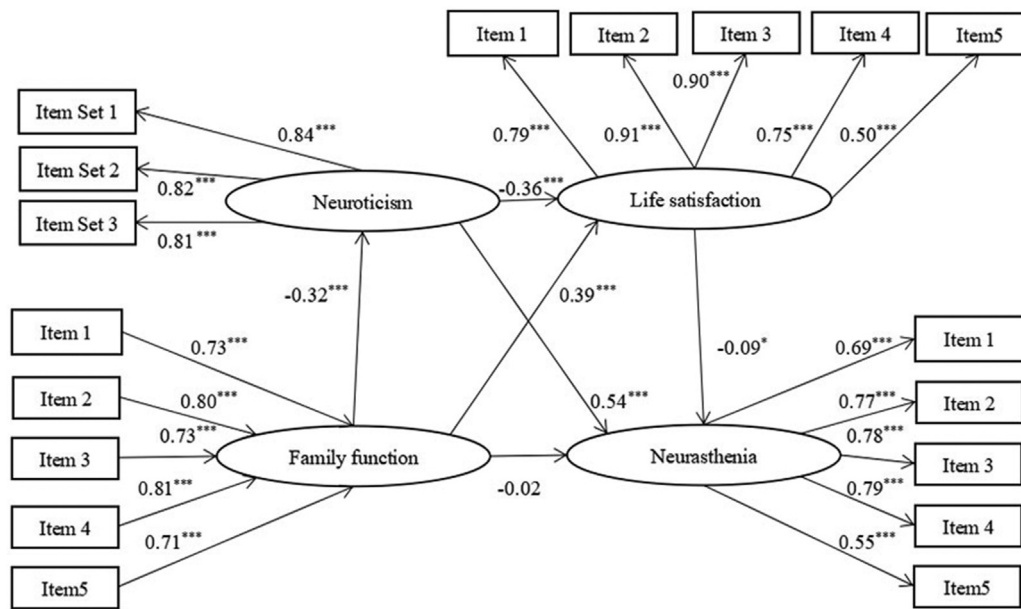
Figure 3. Path analysis depicting direct and indirect effects of family function on neurasthenia. Standardized coefficients are presented. Covariates were included in the model but are not presented for simplicity. Note. *P < 0.05, **P < 0.01, ***P < 0.001. N = 1422.

Table 3. The effect sizes with neuroticism and life satisfaction as mediators.

Effect				Point Estimate (95% Confidence Interval)	Ratio
FF	NA			-0.017 (-0.073, 0.040)	7.23%
FF	NO	NA		-0.174 (-0.224, -0.134)	74.04%
FF	LS	NA		-0.034 (-0.062, -0.012)	14.47%
FF	NO	LS	NA	-0.010 (-0.020, -0.004)	4.26%
Total				-0.235	

Note. FF = family function; NO = neuroticism; LS = life satisfaction; NA = neurasthenia.

psychological stress. Poor family function could increase their risk of neurasthenia during the COVID-19 pandemic.

Secondly, life satisfaction played a mediating role in the relationship between family function and neurasthenia. Family function was closely related to people's life satisfaction (Bai et al., 2020), especially during the COVID-19 pandemic, good family function helped to develop a positive attitude to life (Zhang, 2019), and fostered better coping with stress and life events (Rachele et al., 2020), and thus improved their life satisfaction. Moreover, after their levels of life satisfaction increasing, their mental health would be improved (Lee et al., 2016; Solbjørg et al., 2019), which reduced the risk of neurasthenia.

Finally, a significant path of family function→neuroticism→life satisfaction →neurasthenia was found. This model illustrated that neuroticism acted as a mediator between family function and neurasthenia while life satisfaction mediated the relationship between neuroticism and neurasthenia. This was in agreement with the results of the earlier papers that good family function will form positive personality traits (low neuroticism), being courageous to self-acceptance, and developing less symptom of neurasthenia such as emotional trouble, fatigue, and insomnia (Li et al., 2016). And neuroticism was the strongest predictor of life satisfaction among personality traits (Ulrich et al., 2004; Liu et al., 2012). Highly neurotic individuals carried negative interpretive cognitive schemas (Swickert and Owens, 2010). Neuroticism was previously found to be strongly related to poor well-being (Anglim and Grant, 2016; Han et al., 2021) and to have a direct negative effect on life satisfaction (Pocnet et al., 2016). Moreover, the mediating effect of life satisfaction was partly consistent with the recently reported finding (Hatice and Özkan, 2019; Hufer and Riemann, 2021). Life satisfaction

was a partial mediator of the relationship between mental resilience and psychological stress (Shek and Liu, 2014). It meant that low neuroticism individuals tended to produce positive attitudes to life, which resulting in high life satisfaction. High life satisfaction could promote mental health and further reduce the risk of neurasthenia of urban residents during the COVID-19 pandemic. The results were also partially in agreement with Classic models, life satisfaction which was a mediating variable influenced the relationship between personality traits and neurasthenia. From another point, the mediating serial effect of neuroticism and life satisfaction also suggested that urban residents had poor family support systems and environment, which might result in being always assailed by self-doubt and emotional insecurity, that might make urban residents feel unfulfilled or sad about their life and finally contributed to an increased risk of neurasthenia during the COVID-19 pandemic.

5. Conclusion and limitations

In summary, the present study examined canonical correlation between personality traits and psychological stress, on this basis constructed a serial mediation model to explore influential factors of psychological stress, which contributed to our understanding of the structural characteristics and influential factors of psychological stress of urban residents in Jiangxi province. Moreover, this study contributed a better understanding of the underlying mechanisms in the relationship between personality traits and psychological stress of urban residents in Jiangxi province; these findings had considerable implications for the prevention and intervention of urban residents' neurasthenia and other psychological stress during the COVID-19 pandemic.

This study has some limitations that should be carefully considered when interpreting the results. First among these is the generalizability of the results. As stated previously, the sample was not randomly chosen within Jiangxi province, although we did our best to match urban residents by living city and age, study participants were recruited through psychological intervention programs and through urban communities WeChat group chat. Thus, the extent to which these results can be generalized to the entire province remains unknown. In addition, all the data were collected from questionnaire survey of urban residents. However, questionnaire survey has some limitations, such as masking effect. Finally, our study was conducted through online survey. So urban residents who didn't use the computer or phone might have difficulties in participating in the study. Therefore, on the one hand, we consider the combination of online survey and offline survey in the future study. On the other hand, we consider using other sampling methods to further improve sample representativeness.

6. Implications

In terms of practice, this research has the implication that neuroticism in personality traits can affect psychological stress, and neurasthenia is the dimension which is affected obviously in psychological stress, in this case specifically during the COVID-19 pandemic. It is hoped that this research can become a reference source for all urban residents in China. Through psychological assessment, it proved that if urban residents have high neuroticism, which means that urban residents would take high risk of psychological stress, especially high risk of neurasthenia. These aspects help clinical psychologists and psychiatrists greatly in monitoring high-risk urban residents of psychological stress when it is affected by the COVID-19 pandemic.

Based on the findings of the serial mediation model, family function and life satisfaction had a very significant positive effect on decreasing risk of psychological stress. It is hoped that government, communities, and social organizations in China can strengthen cooperation, update and release credible information about COVID-19 as they come available, promoting the development of family-centered, mental health education for urban residents, so that mental health of urban residents can be given attention. Moreover, we should emphasize the positive role of lowering levels of neuroticism in promoting psychological well-being, improving their life satisfaction, further reducing the risk of neurasthenia. And on this basis, identifying specific subpopulation of urban residents who are at greater risk for psychological stress and taking specific psychological intervention to high risk group immediately.

In terms of research, this study can be a reference for future researchers to consider the shortcomings of this study, so as to produce research results that can strengthen the results of this study.

Declarations

Author contribution statement

Zewen Huang, Heli Lu: Conceived and designed the experiments; Wrote the paper.

Lejun Zhang: Performed the experiments; Wrote the paper.

Lu Xu: Performed the experiments.

Junyu Wang, Yin Li, Jingbo Ma: Analyzed and interpreted the data.

Ming Guo, Xi Xu, Biyi Wang: Contributed reagents, materials, analysis tools or data.

Funding statement

Data availability statement

The authors do not have permission to share data.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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