How social support predicts anxiety among university students during COVID-19 control phase: Mediating roles of self-esteem and resilience

Yacong Shu* | Wenzheng Lin* | Jia Yang | Pengfei Huang | Biqin Li | Xing Zhang

School of Psychology, Jiangxi Normal University, Nanchang, China

Correspondence
Yacong Shu, School of Psychology, Jiangxi Normal University, 99 Ziyang Avenue, Nanchang, Jiangxi Province 330022, China.
Email: daisy.shu@163.com

Biqin Li, School of Psychology, Jiangxi Normal University, 99 Ziyang Avenue, Nanchang, Jiangxi Province 330022, China.
Email: 18146612680@163.com

*Yacong Shu and Wenzheng Lin contributed equally to this work.

Abstract
Public health emergency, such as COVID-19 pandemic, generally has severe impacts on mental health in public. One of the often-neglected negative consequences is that the control and prevention measures of COVID-19 in the post-epidemic can pose psychological threats to public mental health. This study aimed to seek the factors and mechanisms to alleviate this mental health threat based on a sample of university students in China. Accordingly, this study proposed an environmental-individual interaction model examining the multiple mediating effects of self-esteem and resilience in the association between social support and anxiety among university students during COVID-19 control phase. A questionnaire containing multiple scales were administered on the sample of 2734 Chinese university students. Results indicated that social support negatively predicted anxiety through the serial mediating effects of self-esteem and resilience in the association between social support and anxiety among university students during COVID-19 control phase. Findings suggest that effective psychological intervention tools should be...
designed and offered to college students to reduce anxiety distress and improve mental health in the post-epidemic era or the similar situations in the future.

INTRODUCTION

Strict prevention and control measures in COVID-19 epidemic and its proceeding control phase are a recognized double-edged sword. The measures have been demonstrated to be effective means in preventing the virus from spreading in countries such as China (Anderson et al., 2020; Duan et al., 2020), Singapore (Soo et al., 2020), the UK (Lithander et al., 2020). However, those well-intentioned measures for public physical health can have side effects on public mental health (see Huang & Zhao, 2020; Qiu et al., 2020). The prevention and control measures will last unless the mass population has been vaccinated. Even with vaccinated people, those measures are still essential in preventing the virus and its more contagious variants from spreading among vulnerable population (Mandavilli, 2020; WHO, 2021). Also, it is unclear whether the vaccine can remain effective against the rapid emerging variants of COVID-19 (CDC, 2021; UN News, 2020). The prevention and control measures will continue to be one of the most effective means for potential unknown pandemic threats similar to COVID-19. Hence, one critic research question on psychology is to search for the buffer factors to minimize the negative effects of prevention and control measures on the public mental health.

Most of personal attributes directly connected with one’s well-being or mental health appear difficult to alter. One way to improve the mental health, therefore, is through the interaction between environmental factors and individual factors (Chan & Tam, 2020). According to Person-Context Interaction Theories (Magnusson & Stattin, 1998), individuals act in a dynamic person-environment system. Through the process of person-environment interaction, factors of the external environmental system such as family, culture, school can influence internal individual system such as self-evaluation and coping capacity through the promotion of cognitive reconstruction, affecting one’s academic or work achievement, and well-being. During COVID-19 control phase, continuous prevention and control efforts (e.g., facial mask wearing, physical distance) have become the environmental forces influencing public mental health. For instance, physical distance makes people feel isolated, lonely and lack of communication, all of which lead to an increasing level of anxiety (Cao et al., 2020). Accordingly, the remedy for this environmental complication should not overlook the external factors that can improve one’s well-being. To provide one potential route to buffer public mental health, especially for those policy makers and governments, we proposed an environment-individual interaction model that can protect one’s mental health. Specifically, social support as an environmental factor can negatively influence anxiety level through its interaction with individual factors—self-esteem and resilience (see Figure 1).

Anxiety might be one of the most common but threatening mental risks emerged in strict prevention and control measures. By definition, worries about possible upcoming danger or threat is the source leading to this unpleasant complex emotional state (Barlow, 2004). The returning university students could easily experience constant anxiety with the daily reminder of the threats of another COVID-19 epidemic. Research has also shown that university students resuming their education after the COVID-19 epidemic still suffered from substantial COVID-related stress events such as disruptions to the academic and social lives (Zhang et al., 2021). Among university
students, 24.9% of them were afflicted with experienced anxiety (Cao et al., 2020); they experienced higher overall anxiety level than the general population (Wang & Zhao, 2020). Anxiety can easily lead to negative consequences such as academic underachievement, school failure, even suicide attempts, resulting in persistent escalations of mental health complications (Craske et al., 2017). Hence, to solve the mental health threats posed by strict prevention and control measures, the unavoidable obstacle to overcome is the increase anxiety level.

One environmental factor that may reduce one’s anxiety level is social support. Social support refers to the psychological and material resources provided by social environment to buffer against the stressful events (Atri & Sharma, 2006). Regardless of the type of support source, social support makes one feel loved, cared for, respected, and valued, affecting one’s mental health in a positive way (Ao et al., 2020; Zhang et al., 2021). It is an important factor to mitigate individuals’ emotional exhaustion. The classic buffering hypothesis for social support posits that social support can act as a buffer to weaken the negative health consequences of stress (Cohen, 1992). Studies have shown that social support was negatively linked to anxiety (Hou et al., 2019; Lakey & Orehek, 2011; Peng et al., 2012; Rankin et al., 2018). Compared to individuals perceived higher social support, individuals perceived lower social support were 5–6 times more likely to have anxiety symptoms (Ma et al., 2020). Empirical research revealed that mortality salience like COVID-19 can increase one’s affiliation motives (e.g., Wisman & Koole, 2003), indicating that people with higher anxiety level tend to seek social support even from strangers to relieve their stress. Anxiety caused by COVID-19 can be notably reduced if threatened individuals receive efficient social support (Barnett et al., 2021). Social support from others may relieve anxiety of on-campus college students by offering emotional and instrumental help such as online care and communication. Therefore, based on related studies, we proposed Hypothesis 1: Social support can negatively predict anxiety levels among university students during COVID-19 control phase (H1).

We propose that social support can influence anxiety because it is an environmental factor that deeply interacts with the internal factors of individuals. In the context of the external environmental factor impacting on the internal psychological factors, self-esteem and resilience could be two obvious ones by theory. Mortality salience theory posits that once death latent in the unconsciousness in everyday life is awakened, the anxiety and fear related to it will be deepened (Moon, 2019). The constant threat of one’s health from COVID-19 could be a mortality reminder that can cause severe anxiety. Terror management theory (Helm et al., 2018; Schmeichel et al., 2009; Silva et al., 2021) suggests that in coping with the anxiety caused by mortality, one strategy is to restore one’s self-esteem.

Self-esteem is conceptualized as the thoughts and feelings of individuals about their own importance and worth (Rosenberg, 1965b), shaped by self-evaluation and the appraisal from significant others. Post research suggested boosts to self-esteem contributed to reduction of anxiety (de Jong, 2002; Sowislo & Orth, 2013; van Tuijl et al., 2014). Sociometer Hypothesis also contends that self-esteem serves as an interpersonal monitor that fluctuates with changes in perceived interpersonal
relationship status (Leary et al., 1995). Research findings attested that robust social support could positively predict self-esteem (Arslan, 2009; Li et al., 2018), contending that people should establish close connections with other people to enhance their self-esteem. In the post-epidemic era, for on-campus university students who still need to deal with abundant epidemic-related stress events, support from important others may make them easier to affirm themselves and buffer against emotional distress. Thus, we posed Hypothesis 2: Self-esteem mediates the relationship of social support and anxiety among university students during COVID-19 control phase (H2).

Self-esteem may serve as a functioning manifestation of self to show how social support prepares oneself ready for anxiety reduction. Resilience, on the other hand, could be the route of how social support provides the mental capacities for individuals to fight with anxiety. Resilience is defined as a kind of capacity to face and overcome adversities, with personal transformation and growth (Tempski et al., 2015). It refers to both a personal trait and a dynamic process of positive adaptation in the context of significant adversity. While resilience represents a constellation of characteristics that enable individuals to modify their characteristic level and habit mode so as to effectively adapt to circumstances, they encounter (Klohn, 1996), it has also been conceived as a relative resistance to environmental risk or overcoming adversity in the context of person-environment interactions (Herrman et al., 2011). Mounting studies have indeed shown that people with ample social support are more likely to show higher level of resilience (Gaffey et al., 2016; Ruiz-Robledillo et al., 2014). Individuals with robust social support can get effective external resource to help them cope with stressors and increase the possibility of bouncing from adversity successfully. When experiencing challenging or stressful life events, resilience can provide individuals a kind of “immunity” against the negative impacts of stress, as shown in the protective factor model (Garmezy et al., 1984) and the resilience-stress theory (Fletcher & Sarkar, 2013). A wide range of studies identified the positive effects of resilience on anxiety in the youth (Anyan & Hjemdal, 2016; Cole et al., 2014; Paredes et al., 2021). High resilience may drive the on-campus college students to reduce the possibility of suffering from epidemic-related emotional distress by enhancing personal adjustment. In this vein, we made our Hypothesis 3: Resilience plays a mediating role in the relationship of social support and anxiety among university students during COVID-19 control phase (H3).

Changes of external factor (social support) seem to have a direct impact on the functional effects of internal factors (self-esteem and resilience) As one of the three ‘building blocks of resilience’, self-esteem was considered to have a core impact on resilience (Gilligan, 1997). It can be a critical intrinsic factor of resilience and contributes to vulnerability or adaptability of individuals (Kwek et al., 2013). Social support from outside environment can make individuals feel loved and trusted and promote the improvement in inner self-esteem, which could increase their willingness to strive and persist. This allows them to be more resilient and more tolerant of the changes in the face of obstacles and distress. Ample research stated that self-esteem was positively linked to resilience (Arslan, 2019; Chrysi & Katerina., 2021; Tian et al., 2018). Individuals with higher self-esteem experience more resilience than those with lower self-esteem to deal with adverse experiences. Furthermore, previous studies also highlighted the protective roles of self-esteem and resilience on mental well-being (Gao et al., 2019; Liu et al., 2014). Getting access to wide support such as family and friends could help university students build up positive self-evaluation. This positive self can equip them with the mental equipment—resilience, help buffer themselves against COVID-related emotional distress and maintain mental health. As such, in this research, we proposed that social support has effects on anxiety among university students through a serial mediation of self-esteem and resilience during COVID-19 control phase (H4).
Taken together, this study aims to investigate the protective factors that can provide a buffer from psychological distress caused by public events like the pandemic. We proposed an environmental-individual interaction model to explain how the external environmental system impacted the internal individual system and the mechanism of the two systems on people’s mental health in COVID-19 control context. Since few studies have considered the roles of social support, self-esteem and resilience in mental health among the returning university students under public health emergencies like COVID-19, the results of this study can also provide colleges developing response and valuable information to formulate targeted intervention measures for mental health education with high-quality, timely and crisis-oriented psychological services.

METHOD

Participants

With the COVID-19 pandemic under effective control, universities in some areas of China have gradually resumed offline teaching. Initially, the returning students were required to be quarantined in their dormitories for at least two weeks. They were restricted from going outside and could only had meals distributed by the school. After one month, students were gradually allowed to return to classrooms and take classes offline, but they were still confined to campus and all activities were suspended to reduce close contact with other people.

In this context, we collect data online from June 2020 to July 2020. Students from two Chinese universities were recruited as respondents and they were asked to fill out a questionnaire containing multiple scales. All their data were assured to be anonymous and only be used for research purpose. A total of 2970 undergraduate students participated in this study. Two hundred and thirty-six participants whose answers showed consistent pattern or the missing rate exceeded 25% were excluded from the dataset. The remaining sample consisted of 2734 college students (1415 males), ranging age from 16 to 24 years.

Measures

Social support

Social Support Rating Scale (SSRS; α = 0.72; Xiao, 1994) was administered to measure the social support level of the students. The scale consists of ten items that can be divided into three dimensions: subjective support, objective support, and utilization of social support (e.g., “I sometimes ask for help when I’m in trouble”). It has been widely tested in Chinese population with good validity and reliability (Ao et al., 2020; Peng et al., 2012). Higher scores indicate the higher level of social support.

Self-esteem

The Chinese version of Self-Esteem Scale (SES; α = 0.83; Rosenberg, 1965a) was administered to measure self-esteem, including ten items focusing on globing feelings of self-appraisal. The participants were required to evaluate themselves by using a Likert type scale from 1 (strongly
disagree) to 4 (strongly agree). The scale has been widely used with satisfactory reliability and validity (Fang, 2016; Li et al., 2018). Higher scores indicate the higher level of self-esteem.

Resilience

The Chinese version ($\alpha = 0.96$; Yu & Zhang, 2007) of Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) was administered to measure the students’ resilience level. The translated version has been demonstrated to have adequate internal consistency, test-retest reliability, and convergent and divergent validity in the general population and patient samples (Xi et al., 2020). The CD-RISC is a 25-item self-reported questionnaire that assesses the capacity to bounce back from stress and adversity. The Chinese version of CD-RISC consists of three factors: tenacity, strength and optimism (e.g., “I can adapt to the changes”), measuring by a 5-point Likert scale from 1 (not true at all) to 5 (true nearly all of the time). Higher scores indicate the higher level of resilience.

Anxiety

Self-Rating Anxiety Scale (SAS; $\alpha = 0.75$; Zung, 1971) was administered to measure the level of anxiety. The SAS consists of 20 items that asks people to describe how they felt in the past week (e.g., “I feel weak and tired easily”). Each item is rated on a 4-point Likert scale from 1 (never) to 4 (always). Higher scores indicate higher level of anxiety.

Data analysis

The data were processed and analyzed by SPSS 23.0 and Mplus 8.3 program. The two-step procedure (Anderson & Gerbing, 1988) was adopted to analyze the mediation effects. First, the measurement model was tested to assess whether each of the latent variables could be represented by its indicators; Second, if the measurement model was accepted, the structural model would be tested using maximum likelihood estimation in the Mplus 8.3 program.

In order to control inflated measurement errors due to multiple items for the unidimensional latent variable, items to form manifest indicators for each unidimensional construct were aggregated using a parceling approach procedure. The highest loadings were used to anchor each of the two or three parcels and then lower loaded items with higher loaded items were matched to create relatively balance parcels (Little et al., 2002; Zhang et al., 2021). Hence, two item parcels were created for the self-esteem factor and three item parcels were created for the anxiety factor. The following standard fit indices were utilized to assess the goodness of fit of the model (Browne & Cudeck, 1993; Smith & McMillan, 2001): (a) CFI and TLI of 0.90 or more; (b) RMSEA and SRMR of 0.08 or less. Based on the hypotheses of this study, the indirect effects were examined by a bootstrapping procedure with 5000 resamples. When the 95% confidence interval (CI) for an indirect effect does not include 0, the indirect effect can be considered significant (MacKinnon et al., 2004).
**TABLE 1** Descriptive statistic and correlations for variables

| Variables | M    | SD   | 1     | 2     | 3     | 4     |
|-----------|------|------|-------|-------|-------|-------|
| 1 SS      | 32.85| 7.75 | —     | —     | —     | —     |
| 2 SE      | 30.15| 4.43 | 0.413** | —     | —     | —     |
| 3 RE      | 82.86| 17.13| 0.532** | 0.602** | —     | —     |
| 4 ANX     | 30.99| 6.13 | −0.360** | −0.457** | −0.397** | —     |

Abbreviations: SS, social support; SE, self-esteem; RE, resilience; ANX, anxiety.

**p < 0.01.

Ethical considerations

The study was approved by the university's ethics committee. All procedures performed in the data collecting were in accordance with the ethical standards of the institutional research committee.

RESULTS

Common method bias testing

The potential effects of common method bias were checked by using Harman’s single factor test. The results showed that the eigenvalues of 11 factors were >1 and the first common factor was 26.02% of the variance, which didn’t exceed the threshold of 40%. Accordingly, common method bias was not a potential threat in the analysis of current study.

Descriptive statistics and correlation coefficients of variables

The mean values of each construct and their correlation coefficients were presented in Table 1.

The research structural model and hypotheses testing

The mediating effects of self-esteem and resilience were tested in structural equation modeling (SEM, see Kline, 2015). Results of the structure model (see Figure 2) showed that all loadings were significant (p < 0.01), indicating a good fit to the data (RMSEA = 0.042, SRMR = 0.021, CFI = 0.989, TLI = 0.984). As presented in Figure 2, the effect of social support on anxiety was significant (β = −0.244, p < 0.001); social support positively predicted self-esteem (β = 0.527, p < 0.001) and resilience (β = 0.444, p < 0.001); self-esteem could positively predicted resilience (β = 0.422, p < 0.001) and negatively predicted anxiety (β = −0.349, p < 0.001); resilience negatively predicted anxiety (β = −0.080, p < 0.01).

Furthermore, mediating effect was validated using the bias-corrected bootstrap method with 5000 resamples. As shown in Table 2, the mediating effect of self-esteem was significant (−0.184), validating our second hypothesis (H2). The mediating effect of resilience was significant (−0.036), verifying the third hypothesis (H3). The mediating effect of self-esteem and resilience was significant (−0.018) as well, which supported the fourth hypothesis (H4). Therefore, self-esteem and
resilience played a chain-like mediating role between social support and anxiety among university students during COVID-19 control phase.

**DISCUSSION**

The present study examined an environmental-individual interaction model which described the relationships between social support, self-esteem, resilience and anxiety based on an on-campus university student sample during COVID-19 control phase. Social support from family and school in the external environmental system provides various resources and help for individuals to enhance self-evaluation. They would tend to pursue high self-esteem and be more willing to enhance personal adjustment and resilience to alleviate anxiety caused by COVID-19. The internal mechanism of how social support may predict the decrease of anxiety was tested in a multi-variable mediation model. The results revealed that social support negatively predicted the anxiety level of university students with the self-esteem and resilience as the serial mediators. Specifically, social support predicted anxiety through self-esteem and resilience sequentially, indicating the critical roles of social support, self-esteem and resilience in buffering college students from increasing level of anxiety during COVID-19 control phase.

The present study revealed that social support was negatively associated with anxiety during the challenging time of COVID-19 control phase (H1). This finding was consistent with previous research (Lakey & Orehek, 2011; Osborn et al., 2019; Thoits, 2011; Xi et al., 2020). Social support, as an important protective factor, could assist students to successfully transit to university lives (Scharp & Dorrance Hall, 2019). It possibly highlights the validated state of interdependence and makes one feel assured, resulting in the stronger and more positive support-health linkage (Park...
et al., 2013). Social support probably played a similar role during COVID-19 control phase. The prevention and control measures in COVID-19 possibly led to the psychological distress risk. Effective social support can lower the assessment of stressful events of university students, thereby reducing the harmful emotional influence of stress exposure.

Furthermore, our results indicated that social support reduced the anxiety level of students through an environment-individual interaction model (see Figure 1). Social support of the external environmental system can motivate individuals to make positive self-evaluation and pursue self-esteem of the internal individual system, which can buffer them against feelings of anxiety and promote mental health. This finding supported our second hypothesis (H2) that self-esteem mediated the association between social support and anxiety. A quantity of previous research repeatedly revealed that social support is positively correlated with self-esteem (Rees & Freeman, 2009; Weber et al., 2010); and self-esteem is negatively correlated with anxiety (Guil et al., 2019; Hiller et al., 2017; Kim & Koh, 2018; Landazabal et al., 2008). More importantly, through the mediating effect of self-esteem, social support had a far-reaching buffer against emotional distress (Bayani, 2016; Kong et al., 2012; Kong & You, 2013). Social support source can offer individuals social and psychological support from peers, family and teachers. This kind of attention and acceptance from outside are likely to promote the inner positive self-evaluation, buffering against anxiety and specifically anxiety elicited by awareness of human mortality.

Our findings also found clear support for the third hypothesis (H3) that social support associated with anxiety among university students through the mediating effect of resilience during COVID-19 control phase. Parallel with the results of past research, resilience had a negative effect on the generation and development of anxiety (Hjemdal et al., 2011; Labrague & De Los Santos, 2020; Liu et al., 2018; Min et al., 2015) and also mediated social support and anxiety (Brailovskaia et al., 2018). Persistent connections to other people could equip individuals with coping resources to overcome obstacles and setbacks, helping them to adapt to or recover from negative emotions such as anxiety (Hu et al., 2015; Klibert et al., 2014). The findings in the present study gave some strength to the important mediating role of resilience between social support and anxiety in the returning university students. It seemed to be indispensable to maximizing resilience during COVID-19 crisis (De Brier et al., 2020).

Last and most important, the serial mediating effects of self-esteem and resilience on the relationship between social support on anxiety among university students during COVID-19 control phase provided evidence to the fourth hypothesis (H4). The multiple mediating effect of extrinsic (i.e., social support) and intrinsic (i.e., self-esteem and resilience) factors profoundly reduced anxiety caused by COVID-19 related negative events. The inner attributes that are close related to one’s mental health or well-being are not easy to alter, while the external environmental factors such as interpersonal communication, social adaptation, the establishment of good relationships can affect one’s inner world. In the environment-individual interaction model, care and help from outside can make individuals perceive a sense of security, enhance their self-beliefs and be more resilient to the adverse experiences. Going beyond this, according to a two-dimensional model of self-esteem (Miller & Daniel, 2007), self-esteem was believed to play a vital role in improving resilience. Self-esteem is not just a sense of self-worth, but has to be complemented by a sense of self-competence that one has the ability to respond calmly to the challenges that one faces. Studies showed that self-esteem had a positive predictive effect on resilience (Khampirat, 2020; Mouatsou & Koutra, 2021). During COVID-19 control phase, continuous attention and care from extended family and friends, and positive school experiences can greatly reduce the intensity of threats by the epidemic among on-campus college students. They could perceive love and belonging, which possibly boost their self-beliefs and help them keep finding the inner strength. Feeling competent
allows college students to be better able to bounce back from epidemic-related events, inititatively find ways to relieve anxiety and adapt in anxiety-provoking situations.

Overall, our findings argued that social support affected anxiety of university students through the multiple mediating effects of self-esteem and resilience during COVID-19 control phase. This signifies that the effective and robust support from outside can inspire university students to resist the negative effects of anxiety since the high level of self-esteem and resilience would help them to overcome difficulties and face challenges. In view of the fact that few studies, to our knowledge, have integrated social support, self-esteem, resilience and anxiety in a unified model, our results enlighten the significance for psychological well-being problems in universities during the post-epidemic era. Furthermore, in the on-campus environment, except for giving timely and effective attention and support to college students, effective psychological intervention tools could be designed and offered by university administrators as well as teachers to guide on-campus students to boost their confidence and adaptability. This could help them successfully navigate through the negative impact of anxiety caused by academic distress and social distance, etc. in the post-epidemic era or the similar situations in the future.

Although it is widely believed that the pandemic of COVID-19 would be put to an end after most people around the world were vaccinated, researchers have warned that the vaccines would lose their effect if the variants of COVID-19 mutated drastically and rapidly (Bewick, 2021; Liu et al., 2021). This may cause the strict prevention and control measures resume their place waiting for the more effective vaccines. This research provides governments and policy makers a potential way to relieve the anxiety level of public by creating supporting social environment for people in strict prevention and control measures. During COVID-19 control phase, providing people comprehensive information regarding epidemic prevention, efficient communication, a safe work and living environment can enhance people’s self-beliefs in fighting against the epidemic and allow individuals to better adjust personal resources to cope with the challenges. This may effectively reduce the incidence of emotional distress such as anxiety caused by epidemic-related events and promoting health and well-being in public.

Limitations

Several limitations need to be noted. To begin with, the current research was on a university student sample and has not been conducted on other populations. In the future, it could be further investigated on other populations and in other cultures to improve the generalizability of the present findings. Furthermore, the current study was a cross-sectional design so longitudinal or experimental researches can be adopted to better understand the causal relationship among the variables in this study.

CONCLUSION

The present study aimed to investigate the association between social support and anxiety on a large sample of university students during COVID-19 control phase. The findings of this study confirmed the association between social support and anxiety levels. Also, this research verified the serial mediating roles of self-esteem and resilience in the relationship between the social support and the anxiety. The results suggest that the targeted provision of projects such as psychological mutual aid can be effective to lower the incidence and levels of anxiety of college students.
It’s a way to perceive support from outside and promote interpersonal interaction, which can boost self-esteem and strengthen adaptability of college students. Overall, the results of this study provide insights for mental health education and practical interventions in face of public health emergency like the COVID-19 pandemic.

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AUTHOR CONTRIBUTIONS
Yacong Shu, Wenzheng Lin, Biqin Li and Xing Zhang conceived and designed the study; Jia Yang and Pengfei Huang collected data; Yacong Shu and Jia Yang analyzed the data; Yacong Shu and Wenzheng Lin wrote the manuscript. All authors approved the final version for submission.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are openly available at https://osf.io/zyxdg/.

OPEN RESEARCH BADGES
This article has earned Open Data Research Design badge. Data are available at (https://osf.io/zyxdg/).

ORCID
Yacong Shu https://orcid.org/0000-0003-0038-7551

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