Understanding cultural factors in mental health during the COVID-19 pandemic: when collectivism meets a tight culture

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Abstract

The long-standing pathogen prevalence hypothesis suggests that collectivism can protect from epidemics and pandemics in terms of psychological well-being. However, studies exploring the protective mechanism induced when collectivism meets cultural tightness (the strength of social norms and tolerance for deviant behavior) are few. Therefore, this study aimed to investigate the protective effect of collectivism in detail considering loose and tight cultural contexts. The sample comprised 2001 Chinese participants ($M_{age} = 18.41 \pm 2.388$ years; 50.2% female). Moderated regression analyses indicated that more perceived risk of COVID-19 predicted severe mental health responses (i.e., depression and anxiety), collectivism moderated this positive relationship but individualism did not. Notably, the protective effect of collectivism is especially evident in tight cultures but ineffective in loose cultures. This study emphasized that the protective effects of collectivism on mental health during a pandemic should be considered within the framework of cultural tightness. This study's findings may advance knowledge about the relationship between cultural type and mental health during epidemics.

Keywords Collectivism · Cultural tightness · Perceived risk · Mental health · COVID-19

In China, a tape loop of "For your and others' health and safety, please wear a mask, scan the QR code to record where you have been, and take your temperature. The prevention of pandemics is a common responsibility for each citizen. Those who refuse to cooperate in prevention or intervention will be handed over to the judicial department for discipline" plays on subway trains, restaurants and shopping malls, and other public places. This intervention strategy embodies the characteristics of a collectivist tight culture, which underlines common benefits and strict orders regarding the pandemic. How has the combination of these cultural factors influenced behaviour and mental health during the COVID-19 pandemic?

COVID-19 has led to the worsening of mental disorders, such as depression and anxiety, because of its unpredictable and rapidly increasing caseload (Nguyen et al., 2020; Xiong et al., 2020). Some researchers have indicated that mental health problems (e.g., depression) could lead to suicidal behaviours during the COVID-19 outbreak (Tong et al., 2021). Therefore, in addition to controlling the number of and rescuing patients with infection, people's mental health should also be considered. As such, identifying factors that trigger and mitigate challenges in mental health has been considered crucial because these factors serve as determinants for strategies and interventions aimed at protecting people's mental health. Collectivism–individualism has been proven to be an important factor influencing psychological responses during the COVID-19 outbreak (Germani et al., 2020). However, studies on whether the impact of collectivism–individualism on psychological reactions will change under different sociocultural conditions or contexts, such as those of tight and loose cultures, are few. Therefore, this study aims to investigate whether the interaction between collectivism-individualism and cultural tightness-looseness can influence psychological reactions due to the presence of COVID-19.

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Perceived risk of COVID-19 and mental health difficulties

The theory of perceived risk divides it into the two psychological dimensions of dread risk and unknown risk (Slovic., 1987). Dread risk perception coincides with the rapid spread of COVID-19 (Bao et al., 2020) and its threat to life (Qiu et al., 2020), while unknown risk perception aligns with the first appearance of COVID-19 (Torales et al., 2020). Accordingly, faced with COVID-19, people perceive a high risk of COVID-19, resulting in the assessment of the presence of COVID-19 as a harmful and life-threatening stress event. The transactional theory of stress and coping indicates that people constantly appraise stimuli within their environments, and when such stimuli are considered stressful (implying threat, harm, or challenge), mental health problems are provoked (Folkman, 1997; Folkman & Lazarus, 1985, 1988). Furthermore, people feel that coping with COVID-19 is difficult because of the infectious, lethal, and unpredicted characteristics of the virus (Hyland et al., 2020; Lipsitch et al., 2020; Zoumpourlis et al., 2020). According to the theory of protection motivation, when the level of perception of risk is high, but the level of effectiveness of self-protection is very low, psychological threats will occur (Roos et al., 2015). Accordingly, we hypothesize that:

> Hypothesis 1: The perceived risk of COVID-19 will positively predict mental health difficulties.

Thus far, the impact of perceived risk of COVID-19 on mental health has been proven across cultural contexts (Feng et al., 2020; Han et al., 2021; Liu et al., 2021). The most important aspect is exploring solutions that may alleviate the impact of the perceived risk of COVID-19 on mental health difficulties. Therefore, this study determines the moderating mechanism that influences the relationship between perceived risk of COVID-19 and mental health difficulties from the perspective of culture.

Collectivism–individualism as a moderator of associations between perceived risk of COVID-19 and mental health difficulties

Collectivism-individualism is often considered an individual cultural orientation (Triandis, 1989) involving personal characteristics and internal values (Gelfand et al., 2006; Zhang & Han, 2021). Many studies have considered it as a variable at the individual level (Kim et al., 2016; Singh & Gupta, 2013; Zhang & Han, 2021). Collectivists emphasize group

interest, responsibility, obligation and obedience, which enable group protection behaviours to occur; thus, they can protect individuals from the invasion of foreign pathogens during an epidemic, curb the spread of disease, and alleviate mental health issues (Kim et al., 2016; Murray et al., 2011; Ulkner et al., 2004). In addition, collectivism relates to more social support (Zhang & Han, 2021). Collectivists generally perceive a sense of social connection, belonging, and protection efficacy during an epidemic. (Kim et al., 2016; Murray et al., 2011). A previous study posited that when people encounter unpleasant life events, the social support of collectivism plays a positive role as a buffer against the destructive effects of stress and disease (Singh & Gupta, 2013; Triandis et al., 1988). Thus, in challenging contexts, such as epidemics, collectivism may exert a protective effect, reducing mental health issues associated with high levels of perceived risk of COVID-19.

Furthermore, social support may play a more positive role in collectivism than in individualism. Collectivism emphasizes the relationships between individuals and groups (Cheng & Lam, 2013). Researchers believe that the psychological well-being of collectivists can be defined by interpersonal relationships (Uchida et al., 2005), and individual mental health relates more with families, friends and significant others (Zeng & Guo, 2012), whereas individualists emphasize "I" consciousness, autonomy and emotional independence (Zhang & Han, 2021). Individualists are inclined to deviate from groups and other people (Kim & Markus, 1999; Triandis & Gelfand, 1998). People with an individualistic orientation may be unable to feel a sense of social connection and thus lack the abovementioned psychological buffer (Kim et al., 2016). When feeling highly vulnerable to a disease, they may respond with a greater decline in mental health. Thus, we hypothesize that:

> Hypothesis 2: Collectivism and individualism will moderate the positive association of perceived risk of COVID-19 and mental health difficulties, such that collectivism and individualism will attenuate and aggravate this positive association, respectively.

Interaction between collectivism–individualism and cultural tightness–looseness

Cultural tightness and looseness refer to the strength of social norms and tolerance for deviant behaviour (Gelfand et al., 2006; Gelfand et al., 2011). Tight cultures implement several rules and orders that require people to self-monitor; loose cultures follow fewer orders and rules and encourage openness, tolerance, and creativity (Gelfand et al., 2021). The theory of tightness–looseness posits that tight cultures are conducive to the survival of groups in a highly threatening environment (Gelfand et al., 2021). Regions that have

historically experienced major threats, such as territorial encroachment, epidemic outbreaks, and lack of resources, tend to have relatively tight cultures (Gelfand et al., 2011).

Cultural tightness–looseness is theoretically different from collectivism–individualism, which mainly focuses on variations in personal characteristics and internal values (Gelfand et al., 2006). Previous studies have generally focused on the sole impact of collectivism–individualism or cultural tightness on psychological responses in cases of epidemic outbreaks (Dong et al., 2021; Germani et al., 2020; Kim et al., 2016). They overlooked the interaction between collectivism and tightness. Perhaps, in a specific sociocultural context, such as in tight and loose cultures, collectivism–individualism exerts a different effect on mental health.

In the face of the once-in-a-century COVID-19 pandemic, areas with tight cultures unconsciously enforced stricter rules and policies for intervention and prevention against the pandemic. Examples of these rules are prohibiting moving at will, wearing masks in public spaces, maintaining social distancing (Gelfand et al., 2021), measuring body temperature, establishing a data platform to track crowd movement in real time, and presenting a nucleic acid detection report when moving from one city to another. A previous study found that tight culture could alleviate mental health difficulties caused by risk perception during the pandemic (Dong et al., 2021), but it is unclear whether this mitigating effect will change with individual self-construal.

Tight cultures are characterized by low tolerance for deviant behaviour and severe sanctions for violators (Gelfand et al., 2006). In such tight cultures, people tend to strictly adhere to the intervention and prevention strategies formulated by the local community. Through these behaviours, individuals are responsible for themselves and the group, which is conducive to harmony and stability within the group under epidemic conditions. Collectivists emphasize the *we* consciousness, that is, group unity, harmony, group protection behaviours (Liu et al., 2019), and individual obedience to the collective (Brewer & Chen, 2007). The abovementioned strong social norms and tight policies in tight cultures match collectivist values. Furthermore, collectivists are more willing to accept tight cultural policies during epidemics to meet the demands for group harmony. Therefore, the buffering effect of collectivism may be more significant in tight cultures.

Individualists regard autonomy, individual initiative, and the right to privacy as important (Brewer & Chen, 2007), and individual needs are prioritized over group needs (Triandis, 1989). During epidemics, strict following of tight intervention policies in areas with tight cultures means that people are required to sacrifice their freedom, interests, and privacy in exchange for the stability of the entire group. Under such conditions, individualists may perceive that

their behaviour is constrained and that their interests are threatened, thereby resulting in more mental health issues.

In areas with loose cultures, community and government interventions and prevention policy-making for COVID-19 may be relatively weak and tardy, which are not conducive to slowing down the epidemic. People may feel that the epidemic is in an uncontrollable state, which thereby reduces their sense of security and increases their panic levels. Individuals with high levels of collectivism may perceive the collectivist perspective as unsafe and unstable and may experience more bouts of depression and anxiety. In addition, areas with loose cultures observe fewer social norms and punishments for those who violate social rules (Gelfand et al., 2011). Many people may not strictly adhere to intervention policies. For example, people may be uncooperative (Gelfand et al., 2021) in terms of wearing masks in public, movement tracking, and measuring temperature while choosing to attend parties. Such negligence could place the entire group at risk. At such times, in the face of the unchangeable social background of loose cultures, high-level collectivists may become anxious and frightened. Therefore, in loose cultures, collectivism may even aggravate the positive association between the perceived risk of COVID-19 and mental health in the context of epidemics.

Individualists with weak collective consciousness may feel that few cumbersome intervention policies exist in areas with loose cultures and that they can retain their privacy and practice increased autonomy. According to person–environment fit theory, the well-being of individuals is enhanced in situations where they can express their values (Oishi et al., 2015). Therefore, we hypothesize the following:

> Hypothesis 3: The three-way interaction effect of perceived risk of COVID-19, collectivism–individualism and cultural tightness on mental health difficulties will be significant.
> Hypothesis 3a: In tight cultures, high levels of collectivism and individualism will attenuate and aggravate the positive association of perceived risk of COVID-19 and mental health difficulties, respectively.
> Hypothesis 3b: In loose cultures, high levels of collectivism and individualism will aggravate and attenuate the positive association of perceived risk of COVID-19 and mental health difficulties, respectively.

The present study

This study aims to explore the psychological reactions of collectivists and individualists to the perceived risk of COVID-19 in loose and tight cultures. First, this study aims to explore the effect of perceived risk of COVID-19 on mental health difficulties (anxiety and depressive symptoms) and the moderating effect of collectivism–individualism between

perceived risk of COVID-19 and mental health difficulties. Second, it aims to analyse the three-way interaction effect of perceived risk of COVID-19, collectivism–individualism and cultural tightness on mental health difficulties.

Methods

Participants and procedure

This study adopted cluster sampling in five universities and four high schools. In the universities, we recruited students from 24 classes; in the high schools, we recruited students from 16 classes. We recruited 2018 participants, of whom 17 participants had missing information. The final sample included 2001 participants (*mean* ~age~ = 18.41, *SD* ~age~ = 2.388 years). Among the participants, 49.8% were male, and 50.2% were female. In terms of composition, 41.6% and 58.4% of the respondents were students in high school and college, respectively. In terms of place of residence type, 47.1%, 29.6%, and 23.3% of the sample were residing in cities, towns, and villages, respectively. In terms of geographical location in China, 1.5%, 22.2%, 47.3%, 22%, 1.7%, 2.4%, and 2.8% of the sample were from central, northeast, east, north, south, southwest and northwest China, respectively.

We conducted all surveys online. First, the class teacher reviewed all of the questionnaires in advance and agreed to this research. Second, we introduced the purpose and contents of the research to the participants. Each participant was provided with an informed consent form prior to the survey. All participants were informed of their willingness to participate, anonymity of data, and the right to withdraw from the study at any time before the survey. Students under the age of 18 and their parents were required to provide informed consent. Finally, participants were requested to fill in basic background information, such as gender, age, registered type of residence, and school type. In addition, they were asked to finish the scales for collectivism, cultural tightness, perceived risk of COVID-19, anxiety and depression. This study was approved by the Research Ethics Review Committee of Beijing Normal University, China.

Measures

Collectivism–individualism

We used the Collectivism–Individualism Scale (Singelis et al., 1995) to access respondents' collectivistic or individualistic orientations. This collectivism–individualism measure has also been validated in Chinese (Huang et al., 2016). Each subscale for collectivism and individualism contains 16 items. Sample items of collectivism were "The well-being of my coworker is very important to me" and "I would sacrifice an activity that I enjoy very much if my family did not approve of it." For individualism, sample items included "It annoys me when other people perform better than I do" and "Competition is the law of nature." All items were rated using a seven-point Likert-type scale, ranging from 1 (completely disagree) to 7 (completely agree). A higher score for collectivism or individualism indicated a higher level of collectivistic or individualistic orientation. The alpha values for the internal consistency of the Collectivism and Individualism Scales were 0.861 and 0.805, respectively.

Cultural tightness

The study adopted five items in the Tightness–Looseness Scale developed by Gelfand et al. (2011) to assess the perception of the respondents regarding the tightness of their area. Sample items include "There are many social norms that people are supposed to abide by in the area where I live" and "In the area where I live, people agree regarding behaviours that are appropriate versus inappropriate for most situations." The items were rated using a six-point Likert-type scale, ranging from 1 (strongly disagree) to 6 (strongly agree). Scores ranged from 5 to 30, with high scores indicating that people perceived a tighter culture in the area of residence. Previous studies have proven that the Tightness–Looseness Scale has good reliability and validity in the Chinese population (Bi, 2016). The alpha value for the internal consistency of the Tightness–Looseness Scale was 0.772.

Perceived risk of COVID-19

The study developed a scale for assessing the perceived risk of COVID-19 on the basis of a scale for the perceived risk of HIV (Napper et al., 2012) to measure the degree of individual perceived risk for COVID-19. The scale consists of four items, including "I feel vulnerable to COVID-19 infection" and "I worry about being infected with COVID-19." Items were rated using a five-point Likert-type scale, ranging from 1 (never) to 5 (nearly every day). Scores ranged from 4 to 20, with high scores indicating that participants perceived more risk for COVID-19. In this study, this scale was found to have agreeable internal consistency (0.838).

Mental health

In general, anxiety and depression are regarded as explicit indicators for measuring mental health in the general population and in individual clinical practice (Kroenke et al.,

2019; Olfson et al., 2014). Therefore, the study considered depression and anxiety together as a latent variable because both fall under the domain of mental health. The Generalized Anxiety Disorder Scale-7, consisting of seven items, was used to assess anxiety symptoms (Spitzer et al., 2006). According to the frequency of anxiety symptoms within the past two weeks, all items were rated on a four-point Likert-type scale, ranging from 0 (not at all) to 3 (nearly every day). We calculated the total score of seven items, with a higher score indicating more serious anxiety symptoms. Participants who scored more than 5 were considered to be experiencing anxiety symptoms (Tong et al., 2016). The substantial reliability of this scale was found to be 0.944. The Patient Health Questionnaire-9 was used to assess depressive symptoms (Kroenke et al., 2001). The scale consists of nine items, which are rated using a four-point Likert-type scale ranging from 0 (not at all) to 3 (nearly every day). Scores ranged from 0 to 27, where participants who scored more than 5 were considered to be experiencing depressive symptoms (Kroenke & Spitzer, 2002). The substantial reliability of this scale was found to be 0.923. In China, the Generalized Anxiety Disorder Scale-7 and Patient Health Questionnaire-9 have been widely used (Feng et al., 2020).

Covariates

The main analyses were adjusted for covariates, such as age, sex (0 = male; 1 = female), school type (0 = high school; 1 = college), place of residence type (city; town; village) and geographical location in China (northeast; east; north; central; south; southwest and northwest). We converted place of residence type and geographical location into the dummy variables before being used in the main analyses. Specifically, place of residence type was converted into two dummy variables, place of residence type 1 (0 = village; 1 = city) and place of residence type 2 (0 = village; 1 = town); geographical location was converted into six dummy variables,

geographical location 1 (0 = central; 1 = northeast), geographical location 2 (0 = central; 1 = east), geographical location 3 (0 = central; 1 = north), geographical location 4 (0 = central; 1 = south), geographical location 5 (0 = central; 1 = southwest) and geographical location 6 (0 = central; 1 = northwest).

Data analyses

First, SPSS 24.0 was used to analyse the correlation of all variables. Next, Mplus 7.4 was used for the main analyses. First, a structural equation model (SEM) was developed to test the moderating effects of collectivism and individualism. Second, we built a three-way interaction model between perceived risk of COVID-19, collectivism–individualism and cultural tightness with mental health as an outcome (Fig. 1) to explore whether cultural tightness moderates the effect of collectivism and individualism. The indicators used to evaluate the acceptability of the model include χ^2/df, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR). If the CFI and TLI were more than 0.9 with RMSEA values less than 0.08, then the model was considered acceptable (McDonald & Ho, 2002). The significance level was set to 0.05 (two-tailed).

Results

Preliminary analyses

The study conducted a Harman single-factor test for the items that the adolescents answered. Nine factors with more than one eigenvalue were identified by non-rotated factor analysis, and the variance explained by the maximum factor variance was 19.2%, which is less than 40%, indicating that there was no serious common method bias (Podsakoff

Fig. 1 Conceptual model of the three-way interaction between perceived risk of COVID-19, collectivism-individualism and cultural tightness on predicting mental health outcomes
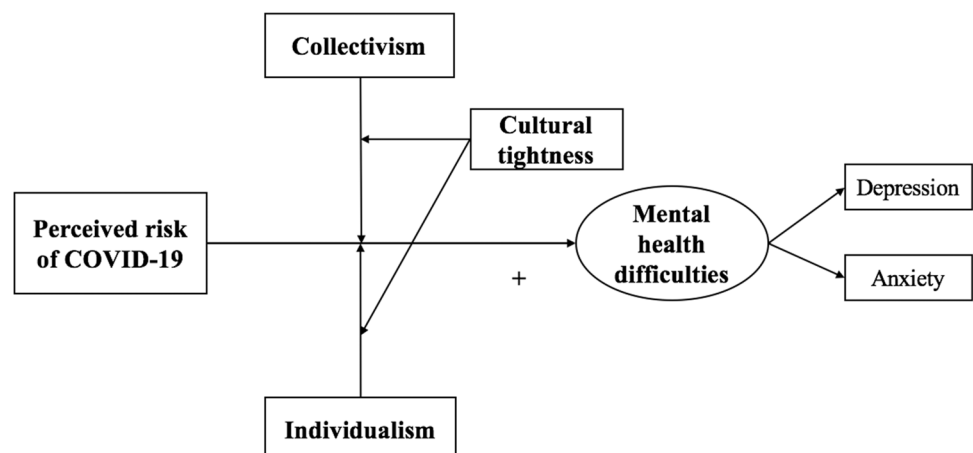
et al., [2003]). We performed the chi-square test and *t* test to explore any difference in background characteristics between adolescents with and without depressive and anxiety symptoms. The results demonstrated no significant difference in terms of sex ($\chi^2 = 2.608$, $p > .05$; $\chi^2 = 0.121$, $p > .05$) or place of residence type ($\chi^2 = 4.347$, $p = 0.114$; $\chi^2 = 5.452$, $p > .05$) between the frequencies of anxiety and depressive symptoms. However, the study observed a significant difference for school type ($\chi^2 = 8.245$, $p < .05$), geographic location ($\chi^2 = 29.924$, $p < .001$; $\chi^2 = 17.655$, $p < .01$) and age ($t = -4.276$, $p < .001$; $t = -3.526$, $p < .001$).

The results of the correlation analysis illustrated a significant positive correlation between mental health difficulties (anxiety and depression) and perceived risk of COVID-19 ($r = 0.216 \sim 0.233$). The relationships of mental health difficulties (anxiety and depression) with collectivism ($r = -0.151 \sim -0.117$) and cultural tightness ($r = -0.102 \sim -0.105$) were significant and negative (Table 1).

Two-way interaction analyses

As previously mentioned, the study constructed an SEM of the perceived risk of COVID-19 as predictors, collectivism and individualism as moderators, the latent mental health difficulties variable as the outcome and age, sex, school type, place of residence type dummy variables, and geographical location dummy variables as covariates to examine the moderating effect of collectivism and individualism. The results evidenced a good fit for the model ($\chi^2/df = 2.663$, CFI $= 0.989$, TLI $= 0.976$, RMSEA $= 0.029$, 90% CI: [0.019, 0.039], SRMR $= 0.005$). High levels of collectivism predicted fewer mental health difficulties ($\beta = -0.156$, $p < .001$). In contrast, high levels of perceived risk of COVID-19 predicted more mental health difficulties ($\beta = 0.249$, $p < .001$). However, collectivism moderated this positive relationship ($\beta = -0.076$, $p < .01$).

The results of the simple effect test demonstrated that low levels of collectivism (1 *SD* below the mean) aggravated the positive predictive effect of the perceived risk of COVID-19 on mental health ($b = 0.285$, $p < .001$), but high levels of collectivism (1 *SD* above the mean) attenuated this effect ($b = 0.167$, $p < .001$) (Fig. 2).
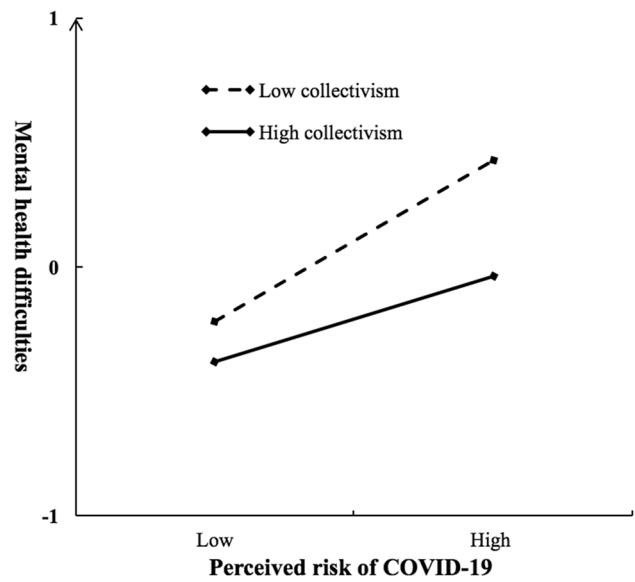

Fig. 2 Two interactions between perceived risk of COVID-19 and collectivism on predicting mental health difficulties outcome

In addition, analyses of individualism indicated that it exerted a major effect on mental health difficulties ($\beta = 0.105$, $p < .001$). However, its moderating effect was non-significant ($\beta = -0.014$, $p > .05$).

Three-way interaction analyses

The study constructed a three-way interaction model with perceived risk of COVID-19 as a predictive variable, collectivism-individualism and cultural tightness as moderating variables, latent mental health difficulties variable as the outcome and age, sex, school type, place of residence type dummy variables and geographical location dummy variables as covariates. The results indicated a good fit for this model ($\chi^2/df = 2.094$, CFI $= 0.991$, TLI $= 0.980$, RMSEA $= 0.023$ (0.014–0.033), SRMR $= 0.004$). The perceived risk of COVID-19 ($\beta = 0.264$, $p < .001$) and individualism ($\beta = 0.100$, $p < .001$) exerted the positive main effects on mental health difficulties. Collectivism ($\beta = -0.173$,

Table 1 Descriptive statistics and correlations among the main variables

	Ranges	*M*	*SD*	1	2	3	4	5
1 Collectivism	16–112	78.44	12.54	1				
2 Individualism	16–112	74.78	11.88	0.417**	1			
3 Cultural tightness	5–30	21.10	3.78	0.448**	0.353**	1		
4 Perceived risk of COVID-19	4–20	6.43	2.60	−0.020	0.040	−0.029	1	
5 Depression	9–36	13.16	5.47	−0.151**	0.021	−0.105**	0.216**	1
6 Anxiety	7–28	9.66	4.33	−0.117**	0.022	−0.102**	0.233**	0.822**

**p < .01

$p < .001$) and cultural tightness ($\beta = -0.056$, $p < .05$) predict less severe mental health difficulties. The two interactions between perceived risk of COVID-19 and collectivism ($\beta = -0.057$, $p < .05$), and between perceived risk of COVID-19 and cultural tightness ($\beta = -0.067$, $p < .05$) exerted significant effects on mental health difficulties. The remaining two interactions showed no significant effects on mental health difficulties. Notably, the three interaction between perceived risk of COVID-19, collectivism and cultural tightness exerted significant effects on mental health difficulties ($\beta = -0.109$, $p < .01$); however, the three interactions between perceived risk of COVID-19, individualism, and cultural tightness were not significant ($\beta = 0.026$, $p > .05$) (Fig. 3).

Specifically, in tight cultures (1 *SD* above the mean), the positive predictive effect of the perceived risk of COVID-19 on mental health difficulties was significant ($b = 0.273$, $p < .001$) at low levels (1 *SD* below the mean) than at high levels of collectivism ($b = 0.097$, $p < .05$) (1 *SD* above the mean). Notably, in loose cultures (1 *SD* below the mean), the moderating effect of collectivism was non-significant ($\beta = -0.015$, $p > .05$) (Fig. 4).

Discussion

As a global calamity, the COVID-19 pandemic has posed unprecedented opportunities for investigating the impact of culture on epidemics, posing challenges for people all over the world (Boyraz et al., 2020). Previous studies have reported that the number of people suffering from mental health issues, such as depression and anxiety (Raihan, 2021; Salari et al., 2020), is gradually increasing, with a growing number of cases. This study found that mental health issues may result from one's perceived risk of COVID-19, consistent with the conclusions of previous studies (Hyland et al., 2020). High
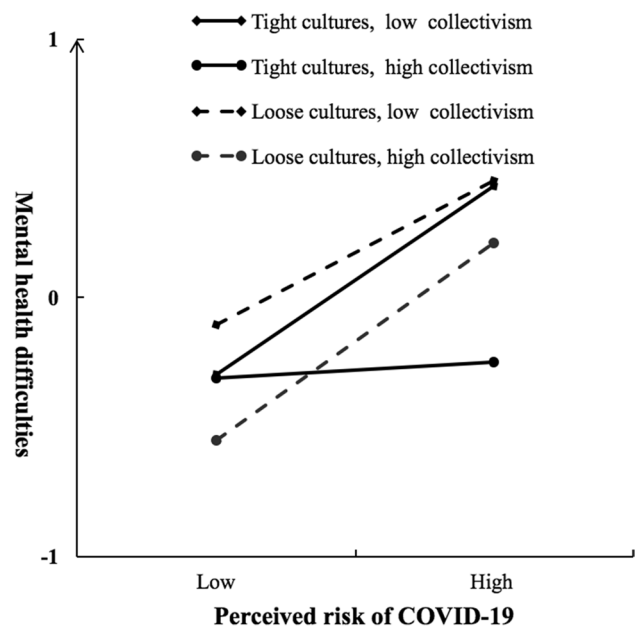
Fig. 4 Three-way interaction between perceived risk of COVID-19, collectivism and cultural tightness on predicting mental health difficulties outcome

transmission rates of the virus make people develop high risk perception. As such, people worry on a daily basis about themselves or their family members' being infected with the virus. People tend to hold high perceptions of risk because of the aggressiveness of the virus and the incompetence of humans against the virus, which leads to mental health issues.

Additionally, this study found that collectivism may alleviate mental health issues caused by the perceived risk of COVID-19. The study illustrates the positive function of collectivism during the COVID-19 epidemic. However, it does not verify the moderating effect of individualism. Relevant studies suggest that when

Fig. 3 Structural equation model for verifying the three-way interaction between perceived risk of COVID-19, collectivism-individualism and cultural tightness on predicting mental health difficulties outcomes. Note: Model was adjusted for age, sex, school type, place of residence type dummy variables and geographical location dummy variables. The dotted line indicates that the predictive effect is non-significant. *$p < .05$, **$p < .01$, ***$p < .001$
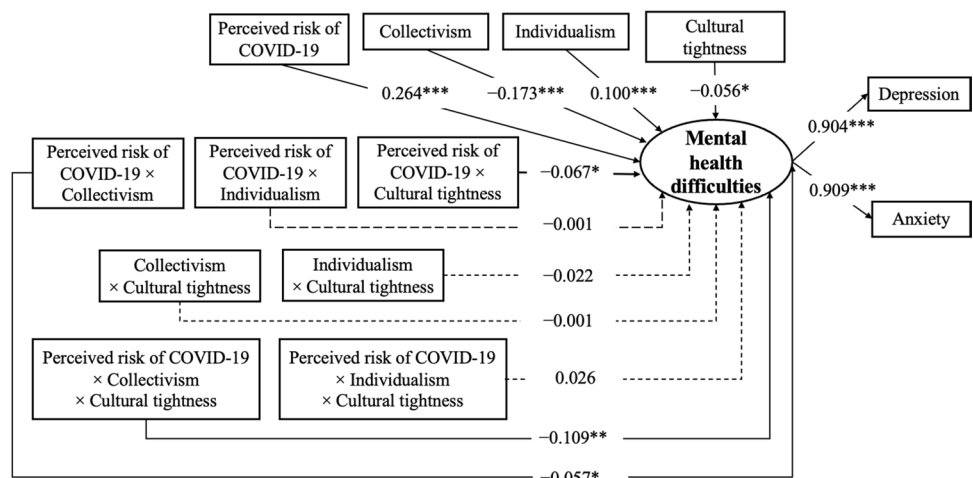
individualists are faced with high levels of risk perception, they are unable to feel a sense of social support and psychological connection (Kim et al., 2016), which aggravates mental health issues. However, many studies suggest that individualists have high levels of the sense of control and self-efficacy (Talhelm et al., 2018), which may reduce the possibility of mental health issues to a certain extent. Therefore, a unified conclusion about the moderating effect of individualism is lacking.

Furthermore, this study explored the secondary moderating effects of collectivism and cultural tightness on the relationship between the perceived risk of COVID-19 and mental health difficulties. The results showed that in tight cultures, the moderating effect of collectivism on the relationship between perceived risk of COVID-19 and mental health difficulties is more significant. Collectivists may hold a heightened sense of security and low levels of psychological distress because this tight intervention strategy intends to make the collective feel safe, which is consistent with the demands of collectivists. Importantly, this study reported that collectivism in loose cultures does not aggravate the positive predictive effect of the perceived risk of COVID-19 on mental health difficulties. This result is not consistent with the study hypothesis. One reason for this result is that collectivism may play a protective role such that collectivists can feel social connectedness and support (Kim et al., 2016). In loose cultures, such social connectedness and support perceived by collectivists remain the same and continue to play a positive role. However, during epidemics, relatively weak social norms in loose cultures may lead to panic among collectivists who pursue group stability and harmony. In this case, collectivism plays a negative role. The protective and destructive effects of collectivism shape these roles and lead to the nonsignificant moderating effect of collectivism. Although this study cannot confirm that mental health issues due to the perceived risk of COVID-19 in areas with high levels of collectivism and loose cultures are more serious, it illustrates that the protective effect of collectivism in loose cultures will be ineffective during the epidemic.

Implications

First, this study verified that collectivism plays a positive role in mental health during the pandemic in China, thus enriching the pathogen prevalence hypothesis, which posits that collectivism can protect against the threats of epidemics. Second, this study found a limitation for the positive function of collectivism in terms of protecting against the threats of epidemics. In loose cultures, the protective effect of collectivism is non-existent; it mainly deepens the understanding of the impact of collectivism on mental health and enriches the theoretical research on the relationship between collectivism and cultural tightness.

This study presents profound practical implications. First, it found that mental health issues might partially stem from one's perceived risk of the virus. Exaggerated risk perception of COVID-19 can lead people to behave irrationally, such as writing alarmist comments on the internet, panic buying, and hoarding, even something like toilet paper (David et al., 2021; Leung et al., 2021). These behaviours will receive negative public attention, trigger a public panic (Leung et al., 2021), and damage public health. However, at the same time, the public need to maintain a realistic risk perception, which can make people aware of the danger, and take protective strategies appropriately, such as wearing masks and maintaining social distance. Thus, this study suggests that individuals should decrease exaggerated or excessive risk perception but keep realistic risk perception, that is, balance realistic against exaggerated risk perception. Second, virus outbreaks, such as those for SARS and H1N1, have been frequent in recent years. Previous studies have demonstrated that the prevalence of anxiety and depressive symptoms increased after epidemics (Tong et al., 2021; Xiong et al., 2020). This study emphasizes that in the context of tight cultures, collectivism plays an effective and positive role in mental health during the pandemic. It provides practical guidance for governments and communities that prefer collectivism as a response to the pandemic, for instance, nurturing people's collectivism around the country in daily life. Furthermore, compared with nurturing people's collectivism over a long period, it may be more feasible to take action on the more stringent anti-epidemic measures over a short time, such as restricting the flow of people, requiring all personnel to wear masks in public places, measuring body temperature every day, and maintaining physical distance and self-isolation.

Limitations

First, the sample in our study only consisted of Chinese students. It is possible that collectivistic culture in China leads to the moderating effect of collectivism being significant, whereas individualism does not. Although the individualism scores were not very low in our sample, the Chinese participants skewed towards collectivism as a whole. Similarly, we also did not find a moderating effect of collectivism in loose cultural conditions. Subjects' perceived cultural tightness was generally high in China. Thus, the results may be applicable only in China, and caution is necessary when generalizing our findings to other cultural backgrounds. Future research should verify the moderating role of collectivism and individualism in other loose and individualistic cultures. Second, this study was limited in causal explanations due to

the method of using self-report questionnaires. Future studies should consider applying experimental methods to verify the ecological validity of the three-way interactive effect of collectivism and cultural tightness.

Conclusion

This study found that in tight cultures, the protective effect of collectivism is evident. In loose cultures, however, collectivism does not play a protective role. This study enriched theoretical research on the relationship between the cultural variables of collectivism with a focus on personal internal values and the variables of cultural tightness with an emphasis on external social norms. This study suggests that governments and communities should adjust their intervention and prevention policies according to the internal cultural characteristics of local residents and simultaneously consider the cultural factors of public mental health and reduce the spread of the virus.

Declarations

Informed consent All participants were informed of their willingness to participate, anonymity of data, and the right to withdraw from the study at any time before being administered the survey. Students under the age of 18 and their parents were required to provide informed consent.

Competing interests The authors have no competing interests.

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Bao, Y., Sun, Y., Meng, S., Shi, J., & Lu, L. (2020). 2019-nCoV epidemic: Address mental health care to empower society. *Lancet, 395*(10224), 37–38. https://doi.org/10.1016/s0140-6736(20)30309-3

Bi, C. (2016). Self-confidence comes when there are rules: The effect of cultural tightness and golden mean thinking (in Chinese). *Journal Southwest University (Social Science Ed), 42*(1), 1–7.

Boyraz, G., Legros, D. N., & Tigershtrom, A. (2020). COVID-19 and traumatic stress: The role of perceived vulnerability, COVID-19-related worries, and social isolation. *Journal of Anxiety Disorders, 76*, 1–9. https://doi.org/10.1016/j.janxdis.2020.102307

Brewer, M. B., & Chen, Y. R. (2007). Where (who) are collectives in collectivism? Toward conceptual clarification of individualism and collectivism. *Psychological Review, 114*(1), 133–151.

Cheng, R. W.-Y., & Lam, S.-F. (2013). The interaction between social goals and self-construal on achievement motivation. *Contemporary Educational Psychology, 38*(2), 136–148. https://doi.org/10.1016/j.cedpsych.2013.01.001

David, J., Visvalingam, S., & Norberg, M. M. (2021). Why did all the toilet paper disappear? Distinguishing between panic buying and hoarding during COVID-19. *Psychiatry Research, 303*(3), 1–10.

Dong, D., Chen, Z., Zong, M., Zhang, P., Feng, Y., & Qiao, Z. (2021). What protects us against the covid-19 threat? Cultural tightness matters. *BMC Public Health, 21*(1), 1–11.

Feng, Y., Zong, M., Yang, Z., Gu, W., Dong, D., & Qiao, Z. (2020). When altruists cannot help: The influence of altruism on the mental health of university students during the COVID-19 pandemic. *Globalization and Health, 16*(1), 1–8. https://doi.org/10.1186/s12992-020-00587-y

Folkman, S. (1997). Positive psychological states and coping with severe stress. *Social Science & Medicine, 45*(8), 1207–1221. https://doi.org/10.1016/s0277-9536(97)00040-3

Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: Study of emotion and coping during three stages of a college examination. *Journal of Personality and Social Psychology, 48*(1), 150–170. https://doi.org/10.1037/0022-3514.48.1.150

Folkman, S., & Lazarus, R. S. (1988). Coping as a mediator of emotion. *Journal of Personality and Social Psychology, 54*(3), 466–475. https://doi.org/10.1037/0022-3514.54.3.466

Gelfand, M. J., Nishii, L. H., & Raver, J. L. (2006). On the nature and importance of cultural tightness-looseness. *Journal of Applied Psychology, 91*(6), 1225–1244. https://doi.org/10.1037/0021-9010.91.6.1225

Gelfand, M. J., Raver, J. L., Nishii, L. H., Leslie, L. M., Lun, J., Lim, B. C., & Yamaguchi, S. (2011). Differences between tight and loose cultures: A 33-nation study. *Science, 332*, 1100–1104. https://doi.org/10.1126/science.1197754

Gelfand, M. J., Jackson, J. C., Pan, X., Nau, D., Pieper, D., Denison, E., ..., Wang, M. (2021). The relationship between cultural tightness-looseness and COVID-19 cases and deaths: A global analysis. *Lancet Planetary Health, 5*(3), 135–144. https://doi.org/10.1016/s2542-5196(20)30301-6

Germani, A., Buratta, L., Delvecchio, A., & Mazzeschi, C. (2020). Emerging adults and COVID-19: The role of individualism-collectivism on perceived risks and psychological maladjustment. *International Journal of Environmental Research and Public Health, 17*(10), 3749–3754.

Han, Q., Zheng, B., Agostini, M., Belanger, J. J., Gutzkow, B., Kreienkamp, J., ..., PsyCorona, C. (2021). Associations of risk perception of COVID-19 with emotion and mental health during the pandemic. *Journal of Affective Disorders, 284*, 247–255. https://doi.org/10.1016/j.jad.2021.01.049

Huang, R., Yao, S., & Zou, T. (2016). Reliability and validity of individualism and collectivism scale in Chinese students. *Chinese Journal of Clinical Psychology, 14*(6), 564–565.

Hyland, P., Shevlin, M., McBride, O., Murphy, J., Karatzias, T., Bentall, R. P., ..., Vallieres, F. (2020). Anxiety and depression in the Republic of Ireland during the COVID-19 pandemic. *Acta*

Psychiatrica Scandinavica, 142(3), 249–256. https://doi.org/10.1111/acps.13219.

Kim, H., & Markus, H. R. (1999). Deviance or uniqueness, harmony or conformity? A cultural analysis. *Journal of Personality and Social Psychology, 77*(4), 785–800. https://doi.org/10.1037/0022-3514.77.4.785

Kim, H. S., Sherman, D. K., & Updegraff, J. A. (2016). Fear of Ebola: The influence of collectivism on xenophobic threat responses. *Psychological Science, 27*(7), 935–944. https://doi.org/10.1177/0956797616642596

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: a new depression diagnostic and severity measure. *Psychiatric Annals, 32*(9), 509–515. https://doi.org/10.3928/0048-5713-20020901-06

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9 - validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kroenke, K., Baye, F., & Lourens, S. G. (2019). Comparative validity and responsiveness of PHQ-ADS and other composite anxiety-depression measures. *Journal of Affective Disorders, 246*, 437–443. https://doi.org/10.1016/j.jad.2018.12.098

Leung, J., Chung, J., Tisdale, C., Chiu, V., & Chan, G. (2021). Anxiety and panic buying behaviour during COVID-19 pandemic-a qualitative analysis of toilet paper hoarding contents on twitter. *International Journal of Environmental Research and Public Health, 18*(3), 11–27.

Lipsitch, M., Swerdlow, D. L., & Finelli, L. (2020). Defining the epidemiology of Covid-19-studies needed. *New England Journal of Medicine, 382*(13), 1194–1196. https://doi.org/10.1056/NEJMp2002125

Liu, S. S., Morris, M. W., Talhelm, T., & Yang, Q. (2019). Ingroup vigilance in collectivistic cultures. *Proceedings of the National Academy of Sciences of the United States of America, 116*(29), 14538–14546. https://doi.org/10.1073/pnas.1817588116

Liu, C., Huang, N., Fu, M., Zhang, H., Feng, X. L., & Guo, J. (2021). Relationship between risk perception, social support, and mental health among general Chinese population during the COVID-19 pandemic. *Risk Management and Healthcare Policy, 14*, 1843–1853. https://doi.org/10.2147/rmhp.S302521

McDonald, R. P., & Ho, M. H. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods, 7*(1), 64–82. https://doi.org/10.1037/1082-989x.7.1.64

Murray, D. R., Trudeau, R., & Schaller, M. (2011). On the origins of cultural differences in conformity: Four tests of the pathogen prevalence hypothesis. *Personality and Social Psychology Bulletin, 37*(3), 318–329. https://doi.org/10.1177/0146167210394451

Napper, L. E., Fisher, D. G., & Reynolds, G. L. (2012). Development of the perceived risk of HIV scale. *AIDS and Behavior, 16*(4), 1075–1083. https://doi.org/10.1007/s10461-011-0003-2

Nguyen, H. C., Nguyen, M. H., Do, B. N., Tran, C. Q., Nguyen, T., Pham, K. M., ..., Tran, T. V. (2020). People with suspected COVID-19 symptoms were more likely depressed and had lower health-related quality of life: The potential benefit of health literacy. *Journal of Clinical Medicine, 9*(4), 965–983.

Oishi, S., Talhelm, T., & Lee, M. (2015). Personality and geography: Introverts prefer mountains. *Journal of Research in Personality, 58*, 55–68. https://doi.org/10.1016/j.jrp.2015.07.001

Olfson, M., Kroenke, K., Wang, S., & Blanco, C. (2014). Trends in office-based mental health care provided by psychiatrists and primary care physicians. *Journal of Clinical Psychiatry, 75*(3), 247–253. https://doi.org/10.4088/JCP.13m08834

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal*

of Applied Psychology, 88(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Qiu, J., Shen, B., Zhao, M., Wang, Z., Xie, B., & Xu, Y. (2020). A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: Implications and policy recommendations. *General Psychiatry, 33*(2), 61–63. https://doi.org/10.1136/gpsych-2020-100213

Raihan, M. M. H. (2021). Mental health consequences of COVID-19 pandemic on adult population: A systematic review. *Mental Health Review Journal, 26*(1), 42–54. https://doi.org/10.1108/mhrj-07-2020-0044

Roos, P., Gelfand, M., Nau, D., & Lun, J. (2015). Societal threat and cultural variation in the strength of social norms: An evolutionary basis. *Organizational Behavior & Human Decision Processes, 129*, 14–23.

Salari, N., Hosseinian-Far, A., Jalali, R., Vaisi-Raygani, A., Rasoulpoor, S., Mohammadi, M., ..., Khaledi-Paveh, B. (2020). Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: A systematic review and meta-analysis. *Globalization and Health, 16*(1), 1–11. https://doi.org/10.1186/s12992-020-00589-w.

Singelis, T. M., Triandis, H. C., Bhawuk, D., & Gelfand, M. J. (1995). Horizontal and vertical dimensions of individualism and collectivism: A theoretical and measurement refinement. *Cross-Cultural Research: The Journal of Comparative Social Science, 29*(3), 240–275.

Singh, A., & Gupta, V. K. (2013). Role of collectivism as a moderator in the relationship between organizational stress and mental health of managerial personnel. *Indian Journal of Positive Psychology, 5*(4), 443–447.

Slovic. (1987). Perception of risk. *Science, 236*(4799), 280–285.

Spitzer, R. L., Kroenke, K., Williams, J., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*(10), 1092–1097.

Talhelm, T., Zhang, X., & Oishi, S. (2018). Moving chairs in Starbucks: Observational studies find rice-wheat cultural differences in daily life in China. *Science Advances, 4*(4), 1–4. https://doi.org/10.1126/sciadv.aap8469

Tong, X., An, D., Aileen, M., Park, S., & Zhou, D. (2016). Validation of the generalized anxiety Disorder-7 (GAD-7) among Chinese people with epilepsy. *Epilepsy Research, 120*, 31–36. https://doi.org/10.1016/j.eplepsyres.2015.11.019

Tong, Y., Conner, K. R., Yin, Y., Zhao, L., & Wang, C. (2021). Suicide attempt risks among hotline callers with and without the coronavirus disease 2019 related psychological distress: A case-control study. *BMC Psychiatry, 21*(1), 363–369.

Torales, J., O'Higgins, M., Castaldelli-Maia, J. M., & Ventriglio, A. (2020). The outbreak of COVID-19 coronavirus and its impact on global mental health. *International Journal of Social Psychiatry, 66*(4), 317–320. https://doi.org/10.1177/0020764020915212

Triandis, H. C. (1989). The self and social-behavior in differing cultural contexts. *Psychological Review, 96*(3), 506–520. https://doi.org/10.1037/0033-295x.96.3.506

Triandis, H. C., & Gelfand, M. J. (1998). Converging measurement of horizontal and vertical individualism and collectivism. *Journal of Personality and Social Psychology, 74*(1), 118–128. https://doi.org/10.1037/0022-3514.74.1.118

Triandis, H. C., Bontempo, R., Villareal, M. J., Asai, M., & Lucca, N. (1988). Individualism and collectivism: Cross-cultural perspectives on selfngroup relationships. *Journal of Personality Arid Social Psychology, 47*(2), 323–338.

Uchida, Y., Norasakkunkit, V., & Kitayama, S. (2005). Cultural constructions of happiness: Theory and empirical evidence. *Journal of Happiness Studies, 5*, 223–239.

Ulkner, J., Schaller, M., Park, J. H., & Duncan, L. A. (2004). Evolved disease-avoidance mechanisms and contemporary xenophobic attitudes. *Group Processes & Intergroup Relations, 7*, 333–353.

Xiong, J., Lipsitz, O., Nasri, F., Lui, L., & Mcintyre, R. S. (2020). Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders, 277*, 55–64.

Zeng, H., & Guo, S. P. (2012). "Le": The Chinese subject well-being and the view of happiness in China tradition culture. *Acta Psychologica Sinica, 44*(7), 986–994.

Zhang, J., & Han, T. (2021). Individualism and collectivism orientation and the correlates among Chinese college students. *Current Psychology, 5*, 1–11. https://doi.org/10.1007/s12144-021-01735-2

Zoumpourlis, V., Goulielmaki, M., Rizos, E., Baliou, S., & Spandidos, D. (2020). The COVID19 pandemic as a scientific and social challenge in the 21st century. *Molecular Medicine Reports, 22*(4), 4–13.