



Need for cognitive closure and trust towards government predicting pandemic behavior and mental health: comparing United States and China

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Abstract

Residents of the United States and China have responded very differently to the implementation of COVID-19 preventive measures. This study introduces the uncertainty reduction theory and the need for cognitive closure (NFC) framework into the context of a public health crisis and compares models across the United States and China. Specifically, we collected survey data to examine how NFC, trust in government, and attitudes toward preventive measures predicted pandemic compliance behaviors, depressive symptoms, and life satisfaction among 745 college students (399 from China and 346 from the United States). Chinese participants trusted their government more, believed COVID preventive measures to be more beneficial, and reported more pandemic compliance and fewer depressive symptoms than U.S. participants. Trust in government and attitudes towards preventive measures mediated the relationships between NFC and pandemic compliance behaviors among Chinese participants but not U.S. participants. NFC predicted better mental health outcomes among participants in China compared to U.S. participants. Trust in government mediated NFC and mental health outcomes among Chinese participants. Trust in government predicted better mental health (fewer depressive symptoms and more life satisfaction) in both the United States and China. Theoretical and practical implications of these findings for promoting mental health and pandemic compliance behavior during the COVID-19 pandemic are discussed.

Keywords Need for cognitive closure · Trust in government · Mental health · COVID-19 behavior · Culture

After the first report of the novel coronavirus (SARS-CoV-2) outbreak in Wuhan, China, in December 2019, COVID-19 spread rapidly and soon led to the declaration of a global pandemic. The novelty and uncertainty of the virus contributed to variations in health policies and public guidelines to mitigate the outbreak across countries as diverse as the

United States and China. After an initial delay, a lockdown was ordered in most cities in China between January 23 and early March, 2020, which included the closing of all schools and nonessential businesses, strict home quarantine (e.g., only one person per family could leave to purchase essential groceries), the wearing of facial masks (both indoors and outdoors), travel restrictions, and widespread contact tracing. In contrast, the U.S. federal government's response was criticized for ineffective testing capacity, unenforced isolation measures, and politicization of preventive measures such as facial masking (New England Journal of Medicine, 2020; Yoo et al., 2020) early in the pandemic. The novelty of the virus, coupled with an inconsistent national response to the public health crisis, resulted in reports of increased stress among many U.S. residents.

Studies have identified individual differences in the coping responses and mental health outcomes of people across the globe, suggesting that the impact of COVID-19 on an individual's well-being differs by how the threat is perceived

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as well as by personality factors, psychological resources (Li et al., 2020; Yıldırım & Arslan, 2020; Zirenko et al., 2020), and trust in social and political actors (Paolini et al., 2020). However, no study to our knowledge has examined differences in individuals' cognitive tendencies for predicting well-being and pandemic behaviors during COVID-19.

The purpose of this study was twofold. First, guided by uncertainty reduction theory (Berger & Calabrese, 1974), the need for cognitive closure (NFC) framework (Kruglanski et al., 2007), and the theory of reasoned action (Ajzen & Fishbein, 1980), we sought to empirically examine the factors that contribute to pandemic compliance behavior and mental health outcomes, and whether trust in government and attitudes toward preventive measures mediate the links between cognitive tendencies and well-being and compliance behaviors. Second, by comparing survey responses from Chinese and U.S. college students during COVID-19, we examined group differences across two countries with markedly different cultural values, government structures, and public health policies related to the handling the pandemic. Given the heightened anxiety and highly politicized context of the preventive measures, we expect that our results will not only extend our knowledge of how cognitive factors influence people's compliance behavior in a novel and uncertain environment but also provide insights on strategies to promote pandemic compliance behaviors and mental health outcomes during COVID-19 outbreaks.

Theoretical framework and hypotheses

Need for cognitive closure

COVID-19 is a novel virus that poses many uncertainties for individuals and governments. According to the uncertainty reduction theory, people are not comfortable with ambiguous feelings and therefore engage in behaviors, such as acquiring more information or seeking out similar others, in an attempt to reduce uncertainty about how to behave appropriately or make sense of a situation (Berger & Calabrese, 1974). The uncertainty reduction theory plays an important role in explaining people's need for cognitive closure (NFC), or "a desire for a definite answer to a question: any firm answer, rather than uncertainty, confusion, or ambiguity" (Kruglanski et al., 2007, p. 1307). NFC also reflects low tolerance for uncertainty (Dugas et al., 2018). Venkatesh and colleagues (2016) found a significantly positive correlation between people's uncertainty reduction and their trust in government organizations. Individuals with high NFC are also more likely to conform to societal norms to reduce uncertainty (Chao et al., 2010; Fu et al., 2007). This adherence to social norms may be especially important

during COVID-19 outbreaks because public health officials rely on the public's compliance with social distancing and wearing masks to help control the spread of the virus. Individuals with high NFC are shown to have a greater likelihood of being influenced by the majority opinion in their beliefs about the relevance of public health prevention. They are more likely to believe that other people also see the public health issue as important and relevant and have a stronger intent to comply with the suggested preventive measures (Chung, 2019). As a result, individuals with high NFC are more likely to comply with societal norms during COVID-19 outbreaks, have positive attitudes towards preventive measures (e.g., social distancing), and engage in behaviors recommended by public health officials to reduce virus transmission. Furthermore, uncertainty during the COVID-19 pandemic has consequences for an individual's mental health because greater perceived uncertainty has been associated with higher levels of depressive symptoms (Gentes & Ruscio, 2011) and lower quality of life (Bailey et al., 2009). Therefore, we hypothesized that:

H1: NFC would be positively associated with trust in government, attitudes towards preventative measures, COVID-19 compliance behavior, and life satisfaction, and negatively associated with depressive symptoms.

The theory of reasoned action

The theory of reasoned action (Ajzen & Fishbein, 1980) suggests that attitudes towards certain behaviors (e.g., perceiving pandemic COVID-19 preventive measures favorably) predict actual behavior. For example, if people believe that following pandemic mitigation guidelines, such as social distancing and wearing masks, are beneficial to their health and well-being, they are more likely to comply with those guidelines. Therefore, they may feel less distressed and report better mental health. Thus, we hypothesized that:

H2a: Attitudes towards pandemic preventive measures would mediate the relation between NFC and compliance behavior and mental health.

The hypothesis about mental health is exploratory because no prior study examined the relationship between attitudes towards preventive measures and mental health.

Trust in government

According to a global survey conducted by *U.S. News* in March of 2020, only 44% of Americans agreed that the U.S. government would protect their health during the COVID-19 pandemic, while more than 80% of the Chinese respondents expressed trust in their government (McPhillips, 2020). This is possibly because the Chinese government

had successfully flattened the curve and the number of new cases had decreased by March, 2020 (McPhillips, 2020). A recent study with citizens from the United States, Kuwait, and South Korea in May 2020 also showed that individuals' positive perceptions of their government's implementation of preventive measures influenced their intent to adhere to the preventive measures (Al-Hasan et al., 2020). When the general public holds a high level of trust in government and perceives that the government's actions align with the common good, they are more likely to support government actions, follow the decisions of government, and comply with public health policies/guidelines (Chowell & Nishiura, 2014; Grimes, 2008; Lindström, 2008; Marien & Hooghe, 2011). Because the purpose of preventive measures such as social distancing is to protect the health of communities for the common good, we hypothesize that the public would be more willing to comply with government pandemic regulations when they trust their governments.

Trust in government also reflects the public's evaluations of the performance of government leaders. People who have lower trust in government leadership may perceive societal living conditions to be poor, which in turn contributes to low life satisfaction and deep discontent. On the other hand, when citizens have a higher level of confidence in their government officials, they tend to report more life satisfaction (Baltatescu, 2009). Similarly, during COVID-19, one study found that trust toward social and political actors predicted increased well-being and decreased distress among adults in Italy (Paolini et al., 2020).

As such, individuals' desires and tendencies to avoid uncertainty may be associated with their trust in government, which may predict pandemic compliance and better mental health. In other words, trust in government can satisfy individuals' NFC and link NFC and behavioral and mental health outcomes. Thus, we hypothesized that:

H2b: Trust in government would mediate the relation between NFC and compliance behavior, life satisfaction, and levels of depression.

The individualism-collectivism framework (Hofstede et al., 2010) explains that China has a collectivist culture in which group needs are prioritized over individual needs or autonomy and compliance with social norms is emphasized, whereas American culture tends to be more individualistic, prioritizing autonomy and freedom of choice above group needs and social harmony (Biddlestone et al., 2020). Before the COVID-19 pandemic, several researchers hypothesized that people in collectivistic cultures may be more likely to respond adaptively to collective efforts in managing public health crises compared to people in individualistic cultures (e.g., Murray et al., 2011). However, this hypothesis was not directly tested.

Within the context of COVID-19, regulations recommended by public health officials such as home confinement may infringe on individuals' freedom while trying to keep the public safe. Researchers have suggested that a collective response to comply with social norms may be crucial during public health crises (Murray et al., 2011). Individuals with collectivistic values may view preventive measures more positively (Hong et al., 2021) and may be more willing to sacrifice their freedom to engage in behaviors that prevent the spread of COVID-19 to promote the health of the general public (Biddlestone et al., 2020). Recent research showed that individualism negatively predicted individuals' intention to engage in social distancing behaviors, while collectivism positively predicted social distancing intentions to reduce the spread of the virus among American and British participants (Biddlestone et al., 2020). Additionally, a comparative study with U.S. and Chinese college students showed that the internalization of shared group goals and values in Chinese participants helped them recognize the potential benefits of stay-at-home orders for themselves as well as for their families and communities, whereas U.S. participants with high individualism prioritized personal interests and autonomy and tended to perceive greater personal barriers associated with stay-at-home behaviors (Hong et al., 2021). Similarly, Gelfand and colleagues (2020) found that more collectivist countries and regions (e.g., Hong Kong, Taiwan, and South Korea) have been more effective in containing the spread of the coronavirus compared to more individualistic countries (e.g., the United States, Spain, and Italy). Given the contrasting sociopolitical responses to the COVID-19 pandemic between China and the U.S., it is pertinent to understand how variations in Chinese and U.S. individuals' trust in government and attitudes towards COVID-19 preventive measures may impact their pandemic behaviors and mental health outcomes in a time of uncertainty. Our study extends prior research to examine the specific cognitive processes (e.g., individual cognitive factors such as NFC), trust in government, and attitudes) on pandemic compliance behavior and mental health among participants in the U.S. and China. We hypothesized that:

H3a: There would be mean level differences in trust in government and attitudes towards preventive measures between Chinese and U.S. participants. Chinese participants would report more trust in government and more positive attitudes towards preventive measures than U.S. participants.

H3b: Trust in government and attitudes towards preventive measures would be more strongly related to all outcomes (more COVID-19 compliance behavior, less life satisfaction, and more depressive symptoms) in Chinese participants than in U.S. participants.

H3c: The mediation relationship of trust in government and attitude between NFC and compliance behavior, life satisfaction, and depressive symptoms would be more salient in Chinese participants than in U.S. participants.

associations among the above-mentioned variables between the U.S. and Chinese participants (H3a, H3b, H3c).

Current study

In summary, we sought to examine how NFC, trust in government, and attitudes toward preventive measures predicted COVID-19 compliance behavior and mental health outcomes (depressive symptoms and life satisfaction), whether trust in government and attitudes mediated these relations, and whether there were cultural differences. Specifically, we hypothesized that (a) NFC would be associated with a higher level of trust in government, more positive attitudes towards preventive measures, increased COVID-19 compliance behavior, less life satisfaction, and more depression (H1); (b) trust in government and attitudes towards preventive measures would both mediate the relations between NFC and COVID-19 compliance behavior and mental health outcomes (H2a, H2b, Fig. 1); and (c) there would be cultural differences in the mean levels and

Method

Procedures

This study was approved by the Institutional Review Board. We collected data from 346 college students in two large universities located in the Mid-Atlantic region of the United States as well as 399 college students from 23 universities in China between March 27 and April 14, 2020. We distributed survey links to college students through university listserv at four universities where most of the participants attended. Researchers also posted the Chinese survey links on social media and recruited an additional 45 students from 21 universities in China.

We invited students to complete an online anonymous survey to share their experiences during COVID-19. Student participation in the survey was voluntary. The U.S. participants received \$5 and the participants in China received ¥10 as compensation for their time. The participating U.S. universities had experienced campus closures beginning

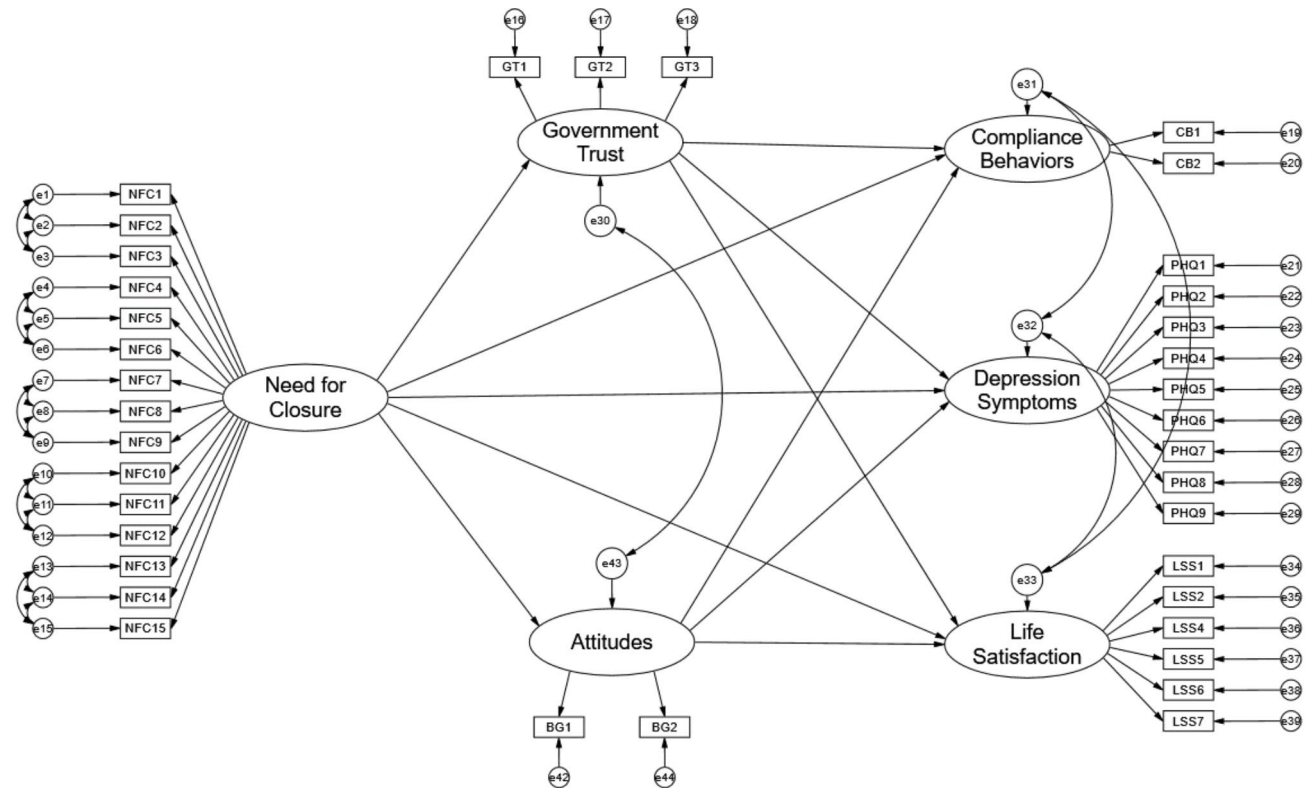


Fig. 1 Hypothesized Model Linking NFC to Compliance Behavior, Depression, and Life Satisfaction via Trust towards Government and Attitudes

March 13, 2020, and all universities in China had been closed since February 2020 due to COVID-19.

Participants

A total of 346 U.S. students completed the survey (68.2% female, $M_{age} = 20.48$, $SD_{age} = 2.30$). The sample was diverse in terms of ethnic and racial background, with a majority of the sample being Asian American (48.8%), followed by White (21.4%), African American (15.3%), Latinx (12.1%), and other (2.4%). While a majority of the participants were in the Southeast United States (84.8%), others were in the Northeast (12%), West (0.3%), Midwest (0.3%), and Southwest (0.8%). A total of 399 Chinese students (57.9% female, $M_{age} = 21.17$, $SD_{age} = 2.33$) completed the measures included in the current study. While a majority of the participants were in eastern China (68.2%), others were in central China (13.5%) and western China (15.3%).

Measures

Demographic information

We collected demographic information, including participants' age, grade level, gender, and race/ethnicity.

Need for closure

We used the Need for Closure Scale (Roets & Van Hiel, 2011) to measure NFC. Participants rated 15 items on a 6-point Likert scale (1 = *strongly disagree*, 6 = *strongly agree*). In the original study (Roets & Van Hiel, 2011), the internal consistency was high (Cronbach's $\alpha = 0.87$) and the convergent and discriminant validity were supported. NFC significantly correlated with right-wing authoritarianism and neuroticism but did not correlate with agreeableness and extraversion (Roets & Van Hiel, 2011). In the present study, confirmatory factor analysis (CFA) suggested that the one-dimension model fit the data well, $\chi^2(75) = 293.205$, $p < .001$, AIC = 383.205, CFI = 0.929, RMSEA = 0.063, 90% CI [0.055, 0.070], SRMR = 0.044. The internal consistency reliability was good ($\alpha = 0.83$).

Trust in government

We developed a three-item Likert scale in which participants reported to what extent they trusted the government (1 = *strongly disagree*, 6 = *strongly agree*). A sample item was, "I trust that the (federal) government can make the right decision and policy about COVID-19." The CFA model was saturated ($\chi^2(0) = 0$, AIC = 12.000, CFI = 1.000),

and all three items had loadings higher than 0.90. For the current study, internal consistency reliability was high ($\alpha = 0.97$). To examine its convergent validity and discriminant validity, we also calculated the correlations between the trust in government scores with the conformity to rules and hedonism subscales in the Portrait Values Questionnaire (Schwartz et al., 2012). Trust in government significantly correlated with conformity to rules, $r = .333$, $p < .001$, but not with hedonism, $r = .01$, $p = .81$. The correlations were consistent with the theory because when people trust the government, they are more likely to value conformity to rules. Trust in government was not theoretically related to hedonism. Participants' scores on trust in government were also consistent with their qualitative answers to the question, "How did COVID-19 change your view of life?" (see the qualitative [results](#) section).

Attitudes towards pandemic preventive measures

Participants were asked to report to what extent they agreed (1 = *strongly disagree*, 6 = *strongly agree*) with the following statements: "I think maintaining social distance (e.g., remaining at home) to contain the virus is a behavior that benefits me," and "I think wearing a facial mask (if available) during COVID-19 is a behavior that benefits me." For the current study, the correlation between the two items was significant ($r = .537$, $p < .001$). Regarding convergent validity, attitudes was significantly correlated with pandemic compliance behavior, $r = .41$, $p < .001$, as well as trust in government, $r = .43$, $p < .001$, and conformity to rules in the Portrait Values Questionnaire, $r = .28$, $p < .001$. Regarding discriminant validity, attitudes was not correlated with the hedonism subscales in the Portrait Values Questionnaire (Schwartz et al., 2012), $r = .02$, $p = .51$.

Pandemic compliance behaviors

We developed two items to assess compliance with COVID-19 prevention guidelines. The two items were: "I am complying with the rules and regulations from the health care system (e.g., social distancing, shelter in place) to try to contain the virus" and "I found it easy to comply with the rules and regulations of the health care system to try to contain the virus." A 6-point response scale (1 = *strongly disagree*, 6 = *strongly agree*) was used. The correlation between the two items was significant ($r = .377$, $p < .001$). Regarding convergent validity, pandemic compliance behavior was significantly correlated with attitudes towards pandemic preventive behavior, $r = .41$, $p < .001$, and the conformity to rules subscale in the Portrait Values Questionnaire (Schwartz et al., 2012), $r = .381$, $p < .001$. Regarding discriminant validity, pandemic behavior was not related

to power dominance in the Portrait Values Questionnaire, $r = -.03$, $p = .39$.

Depression symptoms

To assess depression symptoms experienced during the past 2 weeks, we used the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001). All 9 items are rated on a 4-point scale (0 = *not at all*, 1 = *several days*, 2 = *more than half the days*, 3 = *nearly every day*). The PHQ-9 is a commonly used measure for depression, and a sufficient number of prior studies have demonstrated good reliability and validity of the PHQ-9 (e.g., Kroenke et al., 2010). In the present study, CFA results showed that the model fit well, $\chi^2(23) = 117.160$, $p < .001$, AIC = 161.160, CFI = 0.971, RMSEA = 0.074, 90% CI [0.061, 0.088], SRMR = 0.031. The internal consistency reliability was good ($\alpha = 0.90$).

Life satisfaction

Life Satisfaction, as a component of subjective well-being, is defined “as a summary assessment of a person’s quality of life based on her or his own unique expectations, values, and previous experiences” (Zeng et al., 2018, p.259). To measure participants’ life satisfaction, we used the Student’s Life Satisfaction Scale (SLSS; Huebner 1991), which measures a global evaluation of an individual’s quality of life that goes beyond the judgment of specific life domains. In our study, we asked participants to evaluate their quality of life as a whole. Sample items were “My life is going well” and “I have what I want in life.” The items in the scale were not modified to reflect changes related to the COVID-19 pandemic as the items were intended to be a general evaluation of life. Participants rated seven items on a 6-point Likert scale (1 = *strongly disagree*, 6 = *strongly agree*). The SLSS has demonstrated respectable psychometric properties (e.g., high test-retest and internal consistency reliability, and significant relationships with other measures of life satisfaction; Gilman & Huebner 1997). In the present study, CFA results showed that the revised model fit well, $\chi^2(7) = 39.664$, $p < .001$, AIC = 67.664, CFI = 0.978, RMSEA = 0.079, 90% CI [0.056, 0.104], SRMR = 0.033. The internal consistency reliability of the revised SLSS was acceptable ($\alpha = 0.79$).

Quantitative data analysis

We used Amos to examine the relation between variables of interest. We conducted CFA to examine the factor structure of the whole measurement model with all the items. CFA results showed that the model fit well, $\chi^2(665) = 1977.000$, $p < .001$, AIC = 2207.000, CFI = 0.900, RMSEA = 0.051,

90% CI [0.049, 0.054], SRMR = 0.067. Next, we ran SEM to examine the relationship among latent constructs. To examine the mediation model, we used bootstrapping analysis ($n = 2,000$) to examine the indirect effects because this method has adequate control of Type I errors (Preacher & Hayes, 2008). We considered that a significant indirect effect was observed if the 95% bootstrap confidence intervals for the indirect effect did not contain a zero.

Qualitative data

Participants rated whether or not they agreed with the statement, “COVID-19 has changed my view of life,” and then were asked to explain how COVID-19 changed their view of life. After participants rated whether they agreed with the item, “I think wearing a face mask (if available) during COVID-19 is a behavior that benefits me,” we also asked participants an open-ended question (e.g., “Why do you think so?”) and analyzed the results using content analysis, an inductive approach in which coding categories are derived directly from the text data (Hsieh & Shannon, 2005). The first and third authors coded 25% of responses independently. Intercoder reliability was good ($\kappa = 0.91$). Any coding discrepancies were resolved through discussion, and codes/labels were further refined. The third author then coded the remainder of the answers. Frequencies were calculated to shed insight into the importance of the themes.

Results

NFC predicts pandemic compliance behavior and mental health

This model had an acceptable fit, $\chi^2(437) = 1359.001$, $p < .001$, AIC = 1541.001, CFI = 0.894, RMSEA = 0.053, 90% CI [0.050, 0.056], SRMR = 0.059. Consistent with our hypothesis (H1), results showed that higher NFC significantly predicted more compliance behaviors ($b = 0.215$, 95% CI [0.012, 0.358]) and depressive symptoms ($b = 0.178$, 95% CI [0.090, 0.263]). In contrast to our hypothesis, higher NFC did not predict life satisfaction ($b = -0.036$, 95% CI [-0.130, 0.057]). As a result, H1 was partially supported.

Mediation by trust in government and attitudes

The mediation model fit the data well, $\chi^2(593) = 1783.642$, $p < .001$, AIC = 2003.642, CFI = 0.905, RMSEA = 0.052, 90% CI [0.049, 0.055], SRMR = 0.068. We found that higher NFC did not predict trust in government. However, greater trust in government significantly predicted fewer depressive symptoms ($b = -0.164$, 95% CI [-0.278, -0.049]).

We also found that higher NFC did not predict attitudes towards the impact of preventive behaviors. However, holding more positive attitudes significantly predicted more compliance with pandemic guidelines ($b=0.790$, 95% CI [0.489, 1.141]). The direct effects of NFC on compliance behavior ($b=0.260$, 95% CI [0.100, 0.452]) and depression ($b=0.184$, 95% CI [0.091, 0.276]) were statistically significant, but not for life satisfaction. The indirect effects from NFC on compliance behaviors, depression, and life satisfaction were not statistically significant (H2a and H2b were not supported). However, these mediating paths may have been blurred by differences across cultural groups.

Cultural differences

Consistent with our hypothesis (H3a), Chinese participants ($M=4.94$, $SD=1.0$) reported that they trusted the government more than U.S. participants ($M=2.73$, $SD=1.37$, $t(620)=24.85$, $p<.001$). The Chinese participants reported more positive attitudes towards pandemic preventive measures ($M=5.43$, $SD=0.78$) and more compliance with COVID guidelines ($M=5.38$, $SD=0.70$) than the U.S. participants ($M=4.12$, $SD=1.29$, $t(545.691)=16.927$, $p<.001$; $M=4.95$, $SD=0.97$, $t(620.188)=6.85$, $p<.001$), which was consistent with our hypothesis (H3a). The Chinese participants ($M=9.36$, $SD=6.72$) also reported fewer depressive symptoms than the U.S. participants ($M=7.11$, $SD=5.62$, $t(675.258)=-4.92$, $p<.001$, Table 1).

To examine cultural differences among variables of interest, we first tested measurement invariance including the whole measurement model (all latent factors). We found the configurable model (the fully unconstrained model) fit the data well, $\chi^2(1186)=2243.165$, $p<.001$, $AIC=2683.165$, $CFI=0.911$, $RMSEA=0.035$, 90% CI [0.032, 0.037], $SRMR=0.063$. We then constrained all the factor loadings to be equal across the two groups. The model fit well, χ^2

(1223)=2472.672, $p<.001$, $AIC=2838.672$, $CFI=0.895$, $RMSEA=0.037$, 90% CI [0.035, 0.039], $SRMR=0.065$. The result revealed that the difference between the baseline configurable model and the fully constrained model was significant ($\Delta\chi^2(37)=229.507$, $p<.001$, $\Delta CFI=-0.016$), suggesting that the measurement models were variant between the United States and China. Then, we gradually loosened the paths to test partial measurement invariance. After allowing eight paths to be different across the two groups, we found that the partial measurement invariant model fit the data well, $\chi^2(1215)=2333.031$, $p<.001$, $ACI=2715.031$, $CFI=0.906$, $RMSEA=0.035$, 90% CI [0.033, 0.037], $SRMR=0.064$. The difference between the baseline model and the partially constrained model was not significant ($\Delta\chi^2(29)=89.866$, $p<.001$, $\Delta CFI=-0.005$).

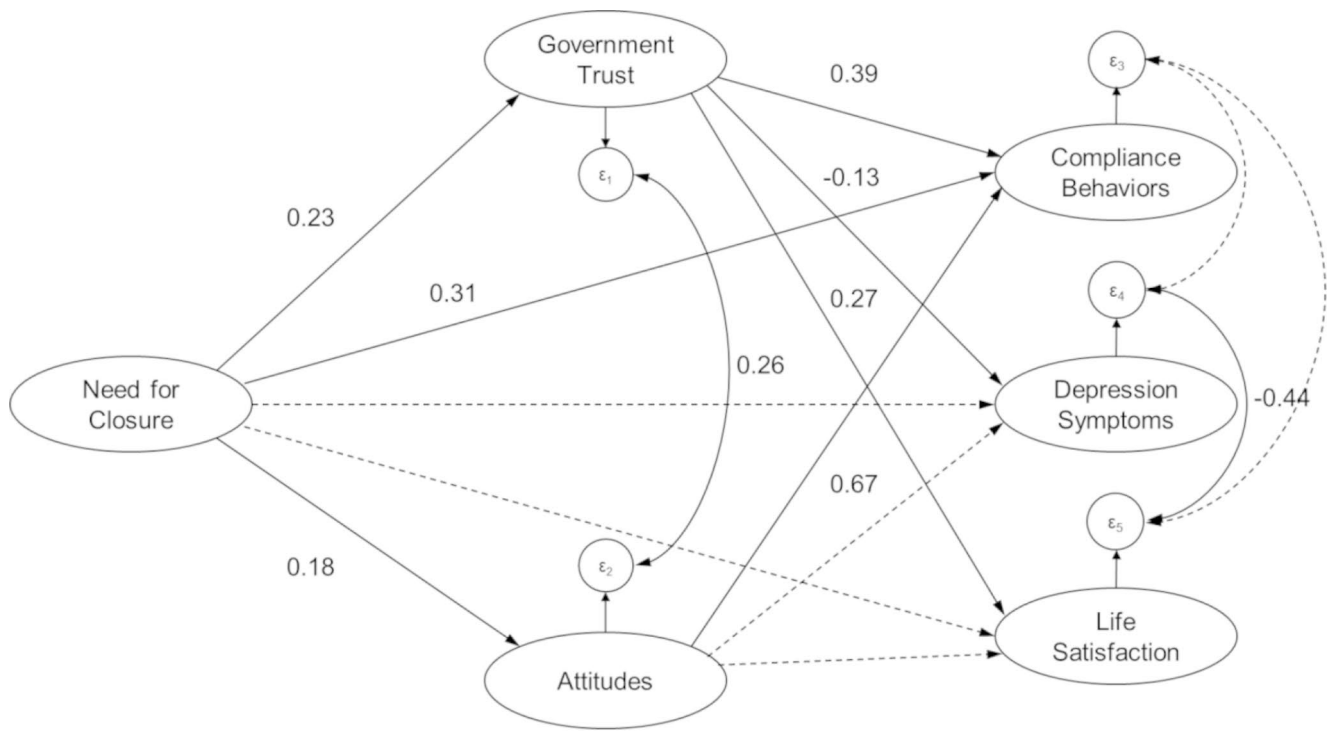
Subsequently, we tested the structural models by countries. The baseline model (all paths freely estimated) fit the data well, $\chi^2(1215)=2330.005$, $p<.001$, $AIC=2712.005$, $CFI=0.907$, $RMSEA=0.035$, 90% CI [0.033, 0.037], $SRMR=0.064$. This baseline model was compared to the fully constrained model, in which all path coefficients were constrained to be equal across the two countries. Results showed that the model fit for the fully constrained model was less acceptable, $\chi^2(1226)=2382.485$, $p<.001$, $AIC=2742.485$, $CFI=0.903$, $RMSEA=0.036$, 90% CI [0.033, 0.038], $SRMR=0.074$, and $\Delta\chi^2(11)=52.480$, $p<.001$, $\Delta AIC=30.48$, suggesting that the mediation model fit differently between the United States and China. H3b was supported.

Among Chinese participants (Fig. 2a), the effect of NFC on participants' pandemic compliance behaviors and well-being was shown to be mediated by trust in government and attitudes towards preventive measures. Having higher NFC significantly predicted greater trust in government ($b=0.225$, 95% CI [0.093, 0.359]), which in turn predicted higher levels of pandemic compliance behavior ($b=0.391$,

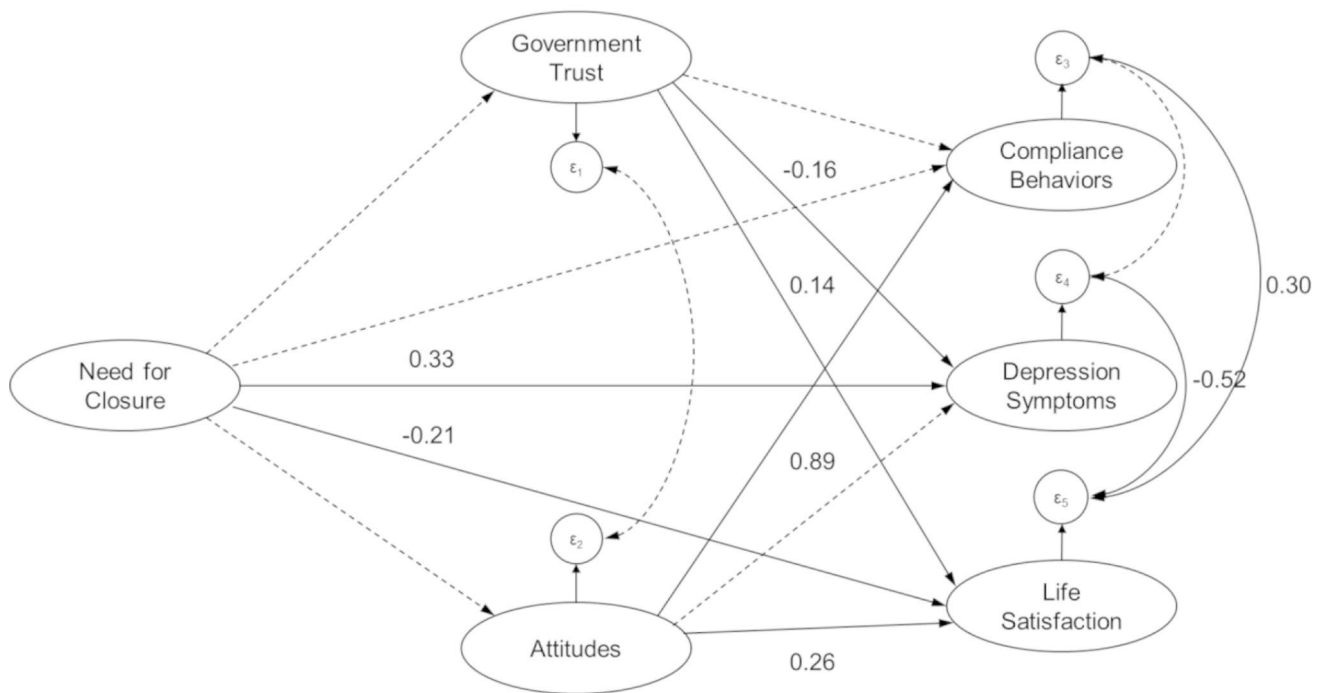
Table 1 Means, SD, Zero-order Correlations, and T-test by U.S and China

Variables	1	2	3	4	5	6	t
1.Need for closure		-0.010	0.098	0.089	0.191**	-0.156**	-1.853
2.Trust in government	0.245***		0.032	-0.051	-0.131*	0.170**	24.853***
3. Attitudes	0.150**	0.253***		0.271***	-0.084	0.176**	16.927***
4.COVID behavior	0.312***	0.394***	0.457***		-0.173**	0.211***	6.851***
5.Depressive symptoms	0.050	-0.108*	-0.040	-0.075		-0.528***	-4.915***
6.Life satisfaction	0.090	0.237***	0.077	0.186***	-0.428***		0.725
Mean (Total)	4.042	3.911	4.824	5.183	8.150	23.882	
SD	0.673	1.620	1.234	0.865	6.250	5.068	
Mean (China)	3.999	4.938	5.429	5.383	7.105	24.008	
SD	0.660	0.996	0.783	0.704	5.619	4.804	
Mean (U.S.)	4.091	2.725	4.121	4.952	9.355	23.738	
SD	0.685	1.372	1.291	0.970	6.716	5.360	

Note. * $p<.05$, ** $p<.01$, *** $p<.001$. The correlations in the top diagonal were based on data from American participants. The correlations in the bottom diagonal were based on data from Chinese participants



(a)



(b)

Fig. 2 SEM Models Linking NFC to Compliance Behavior, Depression, and Life Satisfaction via Trust towards Government and Attitudes **(a)** Chinese Model **(b)** U.S. Model

95% CI [0.206, 0.625]), higher life satisfaction ($b=0.272$, 95% CI [0.141, 0.417]), and fewer depressive symptoms ($b = -0.132$, 95% CI [-0.270, 0.000]). The unstandardized indirect effect of NFC via trust in government on pandemic compliance behavior was 0.088 (95% CI [0.033, 0.187]), on life satisfaction was 0.061 (95% CI [0.023, 0.124]), and on depression was -0.030 (95% CI [-0.082, -0.002]). Higher NFC significantly predicted more positive attitudes towards prevention behaviors ($b=0.183$, 95% CI [0.035, 0.325]), which in turn predicted more pandemic compliance behavior ($b=0.669$, 95% CI [0.369, 1.057]), and the unstandardized indirect effect was 0.123 (95% CI [0.021, 0.292]). The unstandardized direct effects of NFC on compliance behavior ($b=0.307$, 95% CI [0.138, 0.502]) was statistically significant. Therefore, higher NFC tended to have positive effects on compliance behavior through greater trust toward government and more positive attitudes towards preventive measures. Higher NFC tended to have positive effects on well-being through greater trust in government, but not through positive attitudes towards preventive measures. In other words, the mediation hypotheses (H2a and H2b) were partially supported among Chinese participants.

Among U.S. participants (Fig. 2b), NFC did not predict trust in government or attitudes towards prevention behavior (hypothesized mediators), and there were no significant mediation effects (H2a and H2b were not supported). More trust in government predicted fewer depressive symptoms ($b = -0.156$, 95% CI [-0.291, -0.020]) and higher life satisfaction ($b=0.143$, 95% CI [0.010, 0.268]). More positive attitudes towards prevention behaviors predicted more compliance behavior ($b=0.886$, 95% CI [0.477, 1.374]) and higher life satisfaction ($b=0.261$, 95% CI [0.075, 0.475]). The unstandardized direct effects from NFC to depression ($b=0.332$, 95% CI [0.161, 0.499]) and life satisfaction ($b = -0.210$, 95% CI [-0.341, -0.082]) were statistically significant, but not for pandemic compliance behavior ($b=0.274$, 95% CI [-0.020, 0.576]). The different patterns between the two samples supported the cultural difference hypotheses (H3b, H3c).

Attitudes towards wearing masks

Independent-sample *t*-tests showed that compared with U.S. participants, Chinese participants were more likely to believe that wearing masks was beneficial to them ($t = 10.24$, $p < .001$, Cohen's $d = 0.987$). Among 252 American participants who elaborated on their rationale, 57 (22.62%) felt that wearing facial masks was not helpful to prevent the spread of the virus. Seventeen (6.75%) American participants felt that wearing a mask could not prevent them from being infected but could prevent them from spreading the virus (if

sick). Eleven (4.37%) believed that they were at low risk of being infected, so wearing masks was not beneficial.

A total of 398 Chinese participants and 231 American participants responded to an open-ended question, "How has COVID-19 changed your view of life?" Four main themes emerged from their answers, with 102 (25.6%) Chinese and 64 (27.7%) U.S. participants reporting a sense of uncertainty/lack of control as a result of the COVID pandemic. On a positive note, 170 (42.6%) Chinese and 92 (39.8%) Americans mentioned that they would not take things for granted anymore and wanted to live differently, such as protecting the environment, treasuring and trying to make the most of everyday, and spending more time with family and friends.

Some participants expressed their attitudes towards their governments and societies. Specifically, 38 (9.5%) Chinese participants stated that they agreed with how the Chinese government handled the pandemic and recognized the positive roles of the government. Relatedly, 41 (10.3%) Chinese participants described increased awareness of the importance of being united during a crisis and their social responsibility to serve the community compared to seven (3%) U.S. participants who expressed similar views. In contrast, 19 (8.2%) U.S. participants expressed concerns about the government's control over their lives (e.g., social distancing rules), and 18 (7.8%) felt that the government was not reliable and that there were problems in the U.S. health care system. These qualitative data were also consistent with participants' scores on the trust in government measure. Specifically, the ANOVA test showed that participants who mentioned the theme related to positive views of government (e.g., "agreeing with how government handled the pandemic") scored significantly higher on the trust in government measure compared to participants who did not mention themes related to government or participants who mentioned negative perceptions of government in their qualitative responses (e.g., "government was not reliable and that there was a systematic problem in the health care system"), $F(2, 742) = 25.195$, $p < .001$.

Discussion

Based on our knowledge, this is one of the first studies to (a) examine the role of NFC, attitudes, and trust in government in predicting pandemic compliance behavior and depressive symptoms, and (b) compare these findings between the United States and China, two countries with contrasting cultural and political backgrounds and responses to COVID-19. Our findings facilitate a deeper understanding of factors contributing to pandemic compliance and mental health

during COVID-19 and shed light on policies and practices to control the spread of the virus and promote mental health.

Results suggest that during uncertain and stressful health crises, such as the COVID-19 pandemic, NFC, trust in government, and attitudes towards preventive measures play vital roles in promoting public policy compliance behavior and mental health. When both U.S. and Chinese college students trusted their governments to effectively manage public crises, their depressive symptoms were attenuated. Consistent with the theory of reasoned action (Ajzen & Fishbein, 1980), we also found that attitudes towards preventive measures predicted more pandemic compliance, suggesting the importance of promoting positive attitudes to help stop the spread of the virus.

We found significant group differences between the United States and China. Chinese participants reported more trust in government, more positive attitudes towards prevention behavior, and more compliance with COVID-19 prevention guidelines as well as fewer depressive symptoms than U.S. participants. Consistent with the survey data, qualitative results showed that 24% of U.S. participants were not convinced that wearing facial masks was helpful and 8.2% were concerned about government interference in their lives by reinforcing public health guidelines (e.g., quarantines) at the beginning of the pandemic (i.e., late March—early April 2020). However, Chinese participants were satisfied with the government mandates and were more aware of the importance of being united during a crisis. These different responses were also in line with a recent study suggesting that Chinese people's internalized, shared group goals and recognition of the potential benefits of quarantine orders resulted in more compliance with stay-at-home behaviors while U.S. participants tended to perceive more barriers associated with stay-at-home behaviors which negatively predicted the behaviors (Hong, 2021). We extended previous research by examining NFC as a predictor for pandemic compliance and mental health.

Previous studies showed that individuals with high NFC were more likely to follow societal norms (Chao et al., 2010; Fu et al., 2007). While NFC and trust in government predicted more pandemic compliance behavior among Chinese participants, this relation was not supported among U.S. participants when data were analyzed by country. A few factors may explain this difference. First, China has a centralized government and one main political party with multi-party cooperation in exercising State power in China, making it easier for the Chinese government to make swift decisions about nationwide regulations (e.g., mask mandates, quarantine regulations). The United States has a two-party system, uses checks and balances, and has a federalist system (multiple layers of government at the state and national levels). Secondly, during the time of data collection (late

March—early April 2020), the central government in China established very clear nationwide rules and regulations to prevent the spread of the virus and reinforced them from the central government to local government strictly and consistently. However, because the U.S. federal government did not have the power to authorize nationwide rules or policies such as mask or vaccination mandates, different states and districts implemented different regulations with varying degrees of enforcement (New England Journal of Medicine, 2020). As the result of inconsistent preventive measures and government regulations across states, Americans' compliance depended on their individualized attitudes toward the effectiveness of the preventive measures. Furthermore, Chinese people value collectivism more than Americans, and they prioritize group achievement, harmony, and interdependence over personal freedom and independent decision making. They are more willing to sacrifice some freedom for better outcomes for the group (e.g., group benefits and economic outcomes). Readers should keep these differences in mind while interpreting our findings.

We also found that participants' trust in government mediated the link between NFC and all three outcomes (depression, life satisfaction, and pandemic compliance behavior) among Chinese participants but not among U.S. participants. NFC did not predict trust in government or attitudes towards prevention behavior among U.S. participants. Inconsistent guidelines within the U.S. federal government as well as between federal and state policy decisions and the American cultural emphasis on individual freedom and autonomy may have contributed to the mistrust in governmental guidelines among some participants. On the other hand, in a collectivistic country like China, compliance with social norms and working together to overcome external challenges is generally encouraged and valued, especially during crises (people are encouraged to sacrifice individual rights for the well-being of the group). In general, our findings were consistent with prior research showing that people in collectivistic countries are more likely to work together for the common good during a crisis (Biddlestone et al., 2020; Murray et al., 2011).

A cultural difference also emerged for whether NFC predicted individuals' mental health. NFC predicted more depressive symptoms and less life satisfaction among U.S. participants, which is in line with previous studies suggesting that individuals' heightened perception and intolerance for uncertainty is associated with lower perceived well-being (Andersen & Schwartz, 1992; Gentes & Ruscio, 2011; Pagnini et al., 2020). However, this direct relation was not observed in the Chinese sample, and trust in government seemed to have altered the trajectory of NFC in which high NFC predicted better mental health among Chinese participants via high trust in government. The NFC also did not

predict trust in government among U.S. participants. A previous study found that people who had greater interest in and concern for the topic at hand tended to show greater mistrust in government (Grimmelikhuijsen & Welch, 2012). Perhaps the frustration and confusion amid an “infodemic” rather than NFC contributed to U.S. participants’ dissatisfaction with inconsistent government regulations/guidelines, which may have contributed to their mistrust in government as well as jeopardized their mental health.

It is also important to note that other factors in addition to NFC and trust in government and attitudes towards COVID-19 may impact participants’ compliance behavior and mental health. The U.S. and Chinese governments also differ significantly in their fundamental structures (e.g., a centralized government and one main political party in China vs. a two-party and federalist system in the United States). The Bill of Rights in the U.S. constitution recognizes and protects civil rights, such as freedom of speech, freedom of religion, and freedom of assembly and petition (Jiang, 2010). The two countries also have very different economic systems (socialism in China vs. Capitalism in the United States), and philosophies (e.g., Confucianism in valuing obedience, sense of order, and group harmony in China vs. individualism and freedom of choice in the United States). Related to these differences, Chinese adults in general may be more compliant with government rules and regulations and less willing to question government decisions. On the other hand, protecting individual freedom, valuing autonomy, and questioning governmental authority are more acceptable as part of the democratic process in the United States than in China. In addition, mask wearing in public was a common practice across Asian countries long before the current pandemic, including in China, the Philippines, Japan, and Korea, for various environmental (e.g., traffic or air pollution, micro dusts, SARS outbreak) and sociocultural (e.g., courtesy from spreading illness) reasons, which may have influenced the higher level of compliance of Chinese participants’ to mask mandates. These unmeasured factors may have contributed to participants’ perspectives and behaviors. Readers should keep these differences in mind while interpreting our findings.

Implications

This study makes several theoretical contributions to the literature. First, we introduced the uncertainty reduction theory and NFC framework into the context of the current COVID-19 pandemic. Second, we compared relations across two countries with contrasting cultural values, government structures, and policies to handle the pandemic. The results shed light on cross-cultural studies regarding

the influence of cognitive and attitudinal factors on people’s behaviors and mental health outcomes during a health crisis.

Findings from this study also have several practical implications. As schools and college campuses reopened in the fall of 2021 and the omicron variant continues spreading in 2022, it is important to promote positive attitudes towards pandemic preventive measures and unified efforts for the common good during a crisis. Research suggested that wearing face masks (such as KN95) are crucial in preventing the spread of omicron variant (Center for Disease Control, 2022). Although under President Biden’s administration, there has been more consistent messaging about pandemic responses at the federal level, messages and policies at the state and local levels continue to vary. For example, Florida and Texas governors banned mask mandates in August 2021, which was followed by some local school boards defying the governors’ bans. These conflicting regulations may send inconsistent and confusing messages to students and families. To help the general public overcome uncertainty and increase their trust in government, public officials at every level need to communicate clear and consistent messages about the local severity of the virus and how best to prevent community transmission (e.g., vaccination and wearing masks). In addition, messages should emphasize the benefits of complying with preventive measures for the individual as well as for the community (e.g., family, school). These consistent messages will also increase the public’s positive attitudes towards the government and the pandemic preventive measures. Moreover, public health experts and the media could also help promote positive attitudes towards preventive measures by avoiding contradictory messages and striving for accountability in calling out fake news and misinformation online. Furthermore, government officials should avoid politicized debates surrounding preventive measures and contradictory messages that may reduce the credibility of the government. Government leaders also need to set good examples of compliance behaviors (e.g., getting the vaccine, wearing a mask indoors).

Since people in collectivistic countries (e.g., the Chinese participants in our sample) are more likely to work together for the common good during a crisis (Biddlestone et al., 2020; Murray et al., 2011), it might be beneficial for the U.S. government to explore approaches from other countries regarding how to unify the citizens and encourage consistent actions for the common good (Hong et al., 2021). For example, the Chinese government has organized volunteer groups to deliver essential supplies to residents during quarantines. This not only helps to reduce the barriers for quarantine but also helps build community and encourages people to be unified and work together for the common good during a crisis (Hong et al., 2021).

Studies during COVID-19 also have emphasized the role of public officials' effective communication and efforts to mitigate the risk of the pandemic to be central to citizens' behavioral compliance (Al-Hasan, 2020; Chang 2020). To this effect, the government can be more transparent and detailed in their explanation of rules and regulations and proactive actions being taken by the government and others in the community when releasing guidelines on public and social media platforms (Al-Hasan, 2020). Given the ongoing frustration and exhaustion from the prolonged pandemic as well as strong desires to return to "normalcy," improved communication from public officials that lays out concrete actions, consequences of the guidelines to individuals and community, and reliable information from professionals would be helpful to reduce uncertainty and promote greater behavioral compliance and mental well-being.

Limitations and future directions

Results of this study need to be interpreted within the context of the limitations. First, data were collected from only two universities in one U.S. state and from 23 universities (mainly from two universities) in China. Therefore, the data do not reflect the perspective of all college students in these two countries. Participants' behavior and mental health may be influenced by their geographic locations, SES, and political affiliations. In particular, the political leanings of participants in this study who represented mostly the southeastern United States and eastern regions in China may have contributed to sociopolitical bias in this sample. Given the political polarization on pandemic preventive measures (e.g., masking mandates) and perceived risk of the virus in the United States (de Bruin et al., 2020), future studies can also examine how other sociopolitical measures (i.e., political affiliations) intersect with proposed individual and cultural differences to influence individuals' pandemic compliance behaviors and well-being. Second, data relied on participants' self-report, and mono-method bias is a concern. Third, survey data were collected at one time point, and one should not assume causality based on the results. Future studies should consider collecting data using multiple sources and from a more diverse sample longitudinally to examine the impact of COVID-19 on adjustment over time. Fourth, our measure on life satisfaction was not modified to reflect changes related to the COVID-19 pandemic. Future research may consider using measures specifically developed for COVID-19.

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Data availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Code availability Not applicable.

Declarations

Conflicts of interest The authors declare they have no conflict of interest.

Ethics approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the University of Maryland, College Park IRB and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all adult participants included in the study.

Author contribution CW and TY developed and designed the research and collected data; CW drafted the paper; TY revised the paper; DZ and QZ analyzed the data; XW and YC conducted literature review; and JZ collected data.

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