

# Home Quarantine Behavior in College Students: The Internal Mechanism and Cross-National Differences

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**Background:** The COVID-19 pandemic motivated people to stay at home to reduce the risk of COVID-19 infection and community transmission, but limited research has investigated the behavioral mechanisms underlying home quarantine.

**Methods:** Based on the theory of planned behavior (TPB), this study explored the mediating role of intention toward home quarantine and the moderating role of nationality among attitude, subjective norms, and perceived behavioral control. A total of 827 college students from the United States and China were recruited to complete an online survey.

**Results:** The results of structural equation modeling showed that antecedents (ie, attitude, subjective norms, and perceived behavioral control) could predict actual home-quarantine behavior through the role of intention. Notably, the relation between both attitude and intention and perceived behavioral control and intention were moderated by nationality. Specifically, attitude was a stronger predictor of intention for American participants than for Chinese participants; however, perceived behavioral control was a stronger predictor of intention for Chinese participants.

**Conclusion:** These findings reveal the internal mechanism of home-quarantine behavior and the heterogeneous explanations attributed to cultural diversity during the pandemic, which not only expands the application of TPB but also provides a reference for infectious disease mitigation in the field of public health policy.

**Keywords:** COVID-19, home quarantine, cultural difference, theory of planned behavior, college students

## Introduction

In response to the threat of COVID-19 to life and health, people have embraced practical solutions<sup>1,2</sup> to slow down or prevent the spread of infection by purposefully blocking known transmission routes of the virus.<sup>3,4</sup> Among them, *home quarantine*, as a recommended prevention and control behavior, has proven to be an effective means of protection in practice<sup>5</sup> by reducing the risk of transmission and preventing the community transmission of disease.

Although home quarantine has shown sufficient empirical advantages in slowing down the spread of COVID-19,<sup>6</sup> there are gaps in the current research demonstrating the benefits of home quarantine to public health.<sup>5</sup> First, there is limited knowledge of the antecedents and internal mechanisms that influence home quarantine behaviors. According to several studies, home quarantine behavior may be determined by individual cognitive factors such as health beliefs, which include perceived benefits, barriers, susceptibility, and severity.<sup>7</sup> However, whether there are other potential predictors, and how these potential factors interact with each other warrant further exploration within a theoretical framework. Second, it is worth noticing that people in different countries may demonstrate behavioral differences in implementing home quarantine guidelines.<sup>7</sup> Specifically, home quarantine behavior in Western countries (eg, the United States) and in Eastern countries (eg, China) may be substantially different, both nationally and individually. In the

response to the pandemic, the United States has adopted a more state-specific approach in which infection control guidelines and mandates are largely determined by each state government's public health agencies and elected officials.<sup>8</sup> However, China follows a stricter and more centralized home quarantine policy in which the central government determines whole-country policies and mandates.<sup>9</sup> In addition to different national policies, individuals in different countries display different behavior patterns in response to the pandemic. Understanding this phenomenon of cross-cultural differences will provide more targeted recommendations for different countries to formulate scientifically based and culturally appropriate public health policies.

In view of the above two observations, we first applied the theory of planned behavior (TPB),<sup>10</sup> an efficient and widely accepted model for explaining individual behavior, to explore the predictors and intermediary mechanisms that contribute to the home-quarantine behaviors of college students in China and the United States. Because college students are an important young cohort and their health is related to a country's future, their behavior often reflects the cultural orientation of their country or ethnic group.<sup>11</sup> Therefore, we recruited college students as research participants to further explain the differences in individual home quarantine behavior in different countries from the perspective of cultural orientation, specifically the dimension of collectivism-individualism. The purpose of this study was to further examine individual home quarantine behaviors and to explore the heterogeneity of behaviors between different cultures. Such examination will provide additional theoretical and practical contributions to improving policymaking in the field of public health.

## The Internal Mechanism of Home Quarantine Behavior

Practical experience has shown that home quarantine is an effective means to control disease-related epidemics.<sup>5</sup> Home quarantine refers to stay-at-home behaviors adopted to prevent community transmission when major infectious diseases are widespread. During the severe acute respiratory syndrome (SARS) epidemic in 2003, the Chinese government set up quarantine hospitals to treat patients and prevent the disease from spreading.<sup>12</sup> Because infectious diseases such as COVID-19, SARS, and Middle East respiratory syndrome coronavirus (MERS) are transmitted through close physical contact,<sup>3</sup> home quarantine can play an effective role by (a) controlling the source of infection, (b) blocking the transmission route of infection, (c) protecting high-risk populations, and (d) preventing disease transmission between individuals.

Although home quarantine is beneficial to epidemic prevention and control, the execution of this behavior is affected by antecedents.<sup>5</sup> When isolated at home, people typically engage in activities indoors or within their own family unit rather than activities that involve non-family members (such as visiting with friends). Due to the limitations on daily activities, the individual's intention to implement this behavior becomes a direct factor.<sup>13</sup> Behavioral intention is a component of motivation, which refers to the subjective probability of an individual to judge a certain behavior in the future.<sup>14</sup> Because the intention is the direct influencing factor of behavior, if individuals have higher intention to self-isolate, they are more likely to adopt home-quarantine behavior. In a study investigating factors affecting SARS-preventive behaviors, the participants' intentions to perform those behaviors significantly predicted their actual behaviors two weeks later.<sup>15</sup> Recent studies have pointed out that behavioral intention regarding stay-at-home behavior has been recognized as a predictive factor that affects the behavior directly.<sup>7</sup>

Based on the TPB, attitude, subjective norms, and perceived behavioral control may be core variables in predicting behavior.<sup>16</sup> This classic model proposes that attitudes, subjective norms, and perceived behavioral control can predict behavioral performance through the mediation of behavioral intention. Among them, attitude is the degree of approval of an individual regarding a specific behavior. Subjective norms refer to the influence of important others or groups in the process of behavioral decision making. Perceived behavioral control refers to an individual's perception of how easy it is to execute a certain behavior, which reflects the individual's perception of the factors that promote or hinder the execution of the behavior. A number of empirical studies support this hypothesis. For example, in a study on SARS-preventive behaviors in four geographical regions, subjective norms, attitudes, and perceived behavioral control were significantly related to intentions to perform SARS-preventive behaviors.<sup>15</sup> Similarly, in a study of 4853 French-speaking Belgians during the SARS-CoV-2 pandemic, intentions, attitudes, perceived behavioral control, and subjective norms were significantly positively correlated with health behaviors (such as physical distancing and handwashing).<sup>17</sup>

Therefore, the TPB helps to analyze the mechanism of the impact of home-quarantine behavior and provide a meaningful perspective for the study of home-quarantine behavior. Altogether, it appears that attitudes, subjective norms, and perceived behavioral control are positively associated with behavioral intention toward home quarantine, which in turn is positively associated with actual home-quarantine behavior.

## Cross-Cultural Differences in Home Quarantine Behavior

Based on examinations of the internal mechanisms of home-quarantine behavior, emerging evidence has suggested that this procedural relation might have cross-national differences. Given that people of different cultural orientations often display different behavioral patterns toward the same event,<sup>18</sup> we were interested in examining the cross-national differences reflected in the home-quarantine behavior of college students during the COVID-19 pandemic. A study on the effect of nationality on crowding perception found that nationality had a moderating effect on all crowding relationships.<sup>19</sup> That is, Western tourists (eg, USA, UK, German) were more likely to display crowd intolerance and to adopt coping behaviors than mainland Chinese tourists. The prevalence of pathogens also manifests in the different antipathogen defenses of different cultures, with collectivism serving an antipathogen defense function.<sup>20</sup> Thus, it is necessary to further explain the reasons for cross-national differences in home-quarantine behavior.

The cultural orientation of a specific country is regarded as one of the internal explanations for different behavior patterns. Based on Hofstede's cultural dimensions theory, culture refers to a shared mental program that distinguishes a group of people from others in a given environment.<sup>21</sup> Different nations are rooted in different cultural values<sup>22</sup> that could affect the behavior of groups toward specific ideas. Hofstede<sup>23</sup> further pointed out that the values of a country can be divided into individualism and collectivism according to whether a society as a whole is oriented to individual interests or collective interests.<sup>24</sup> People in individualistic societies tend focus more on themselves and their nuclear families; people in collectivist societies tend to focus more on intra-ethnic relations and obedience to authority.<sup>20</sup> It has been suggested that the individualist/collectivist dimension may prove to be an important method for capturing cultural variation.<sup>25</sup> Recent studies support this view that collectivism positively predicts preventive behaviors such as staying at home during the COVID-19 outbreak.<sup>9</sup> To explore the heterogeneity of cognitive mechanisms shaped by different cultures,<sup>20</sup> prior cognitive antecedents (eg, attitude, perceived behavioral control) of behavior are considered based on the TPB.

The predictable relation between home-quarantine attitude and intention remains inconsistent in the collectivism-individualism cultural environment. Attitude is defined as an individual's positive or negative evaluation of a behavior, including the dimensions of cognition, emotion, and behavior.<sup>26</sup> Among them, cognition, which includes perception, is the key component of attitude.<sup>27</sup> Risk perception, as an aspect of risk factors related to cognition, includes perceived severity and perceived vulnerability.<sup>28</sup> Existing evidence suggests that individualism and collectivism moderate the relation between vulnerability and xenophobia (as a self-protective psychology).<sup>29</sup> That is, the association between increased perceived vulnerability and increased xenophobic tendencies is particularly pronounced among those who score high on individualism and low on collectivism. Similarly, risk attitude (ie, persistent severity) had stronger effects on behavioral intention in an American sample than in a Korean sample, which is regarded as a typical collectivist country.<sup>30</sup> Previous laboratory research has demonstrated that priming people's collective ego decreases the attitude-intention relation.<sup>31</sup> China and the United States are recognized as a collectivist culture and an individualist culture, respectively. Based on the above evidence, it can be inferred that home-quarantine attitudes in Chinese and American contexts can positively predict home-quarantine intention, while American students' home-quarantine attitudes have a stronger predictive effect on their intention.

The effect of norms on intention is likely to depend on the cultural context (eg, collectivism-individualism), with stronger normative influences on both intentions and behavior in collectivistic populations.<sup>32</sup> In social psychology, subjective norms have been recognized as a nontrivial factor in predicting intentions.<sup>32</sup> Triandis proposed that norms are more important for individuals in collectivistic contexts based on his classic definition of individualism-collectivism.<sup>33</sup> According to the Leung-Morris model, perceived norms drive behavior more in a strong connection context (eg, a collectivist culture).<sup>34</sup> This may be due to individuals being more inclined to pay attention to normative information in collectivistic environments. Thus, norms may have a stronger predictive effect on intention in a collectivist society. Based on cultural differences between China and the

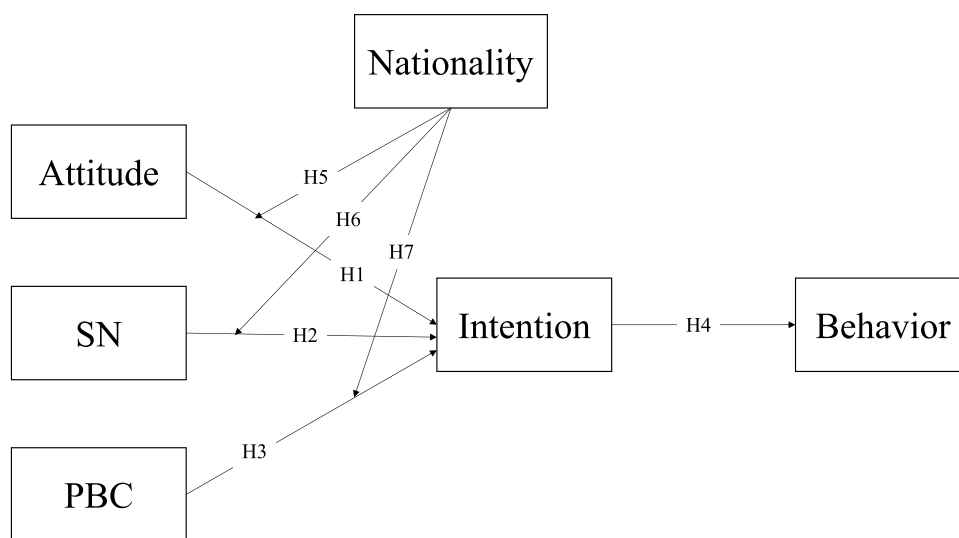
United States, it can be further hypothesized that Chinese students’ subjective norms may have a stronger predictive effect on their home-quarantine intention.

Collectivism and individualism may moderate the effect of perceived behavioral control on intention. First, Ajzen suggested that perceived behavioral control is often assessed by the ease or difficulty of the behavior, which is considered similar to self-efficacy.<sup>10</sup> Prior studies found that control could be divided into personal control and collective control. Personal control is more critical in individualist cultures and collective control is more critical in collectivist cultures.<sup>35,36</sup> Home quarantine is more related to collective control, so college students under the cultural context of Chinese collectivism may reveal stronger potential predictive power of perceived behavioral control regarding intention. Second, East Asians are likely to account for behavior by referring to surrounding social and contextual factors, whereas Westerners are likely to account for the behavior of a target person (including the self) in terms of internal traits and dispositions.<sup>37</sup> Because collectivist China has provided high-efficiency resources supply for home quarantine (such as maintaining an adequate supply of essential items and revamping supply chains by the core leader, as well as noncontact delivery through party organizations in communities), which constitute a comprehensive social and contextual advantage, perceived behavioral control is thought to exert a stronger impact on behavioral intention in collectivistic cultures.

### Present Study

Based on the above review, the internal mechanism of home quarantine, which serves as a vital protective behavior during the COVID-19 epidemic, continues to be vague. Furthermore, existing evidence suggests that these behavioral patterns may be different across the cultural environments of collectivism and individualism. Considering the importance of a country’s youth to society and the degree to which they represent the national culture, we recruited Chinese and American college students as research participants to represent the two different cultures. Based on the TPB, we further explored the mediator and moderator roles of home-quarantine behaviors to provide culture-specific recommendations to national health institutions during the COVID-19 pandemic. The corresponding hypotheses were proposed as follows (see in Figure 1):

- H1: Attitude is positively correlated with home-quarantine intention.
- H2: Subjective norms are positively correlated with home-quarantine intention.
- H3: Perceived behavioral control is positively correlated with home-quarantine intention.



**Figure 1** The hypothesis model of home-quarantine behavior.

**Abbreviations:** Attitude, home-quarantine attitude; SN, home-quarantine subjective norm; PBC, home-quarantine perceived behavioral control; Intention, home-quarantine intention; behavior, home-quarantine behavior.

H4: Home-quarantine intention is positively correlated with home-quarantine behavior.

H5: American students' attitude has a stronger predictive effect on their home-quarantine intention.

H6: Subjective norms among Chinese students have a stronger predictive effect on their home-quarantine intention.

H7: Perceived behavioral control among Chinese students has a stronger predictive effect on their intention.

## Methods

### Participants

To examine the differences in home-quarantine behaviors between college students from collectivist- and individualist-oriented cultures, a total of 827 college students were recruited from China and the United States, respectively, using an online survey; 498 students (60.22%) were from China and 329 students (39.78%) were from the United States. These two countries are reported to be representative of individualist and collectivist cultures. All students participated voluntarily and were informed of the principles of confidentiality and withdrawal. Data were collected in May and June 2020, a period when the COVID-19 epidemic was relatively widespread in both countries. The participants reported their demographic information including age, sex, and nationality. The average age of all students was 21.46 years ( $SD = 4.20$ ). Among them, 237 were males (28.66%), 538 were females (65.05%), and seven students (0.85%) did not report their gender. Our study was conducted in accordance with the Declaration of Helsinki. We obtained approval from the Academic Ethics Committee of the Faculty of Psychology at Beijing Normal University in China and Fordham University in the United States, respectively. To ensure the measurement invariance and consistency of the same measurement tool in different languages, two psychological researchers and two doctoral students from China and the United States conducted comparative translation of the questionnaires. Therefore, the applicability of the questionnaire in different contexts was reliably confirmed. The details of the questionnaires are described in the following sections.

### Measurement Questionnaires

#### Questionnaire of Attitudes

To measure college students' attitudes toward home quarantine, a questionnaire of attitudes was adapted from Lu, Zhou, and Wang<sup>16,38</sup> to fit the context of COVID-19, such as "Staying at home is a good idea". It contained three items and used a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating more favorable home-quarantine attitudes. The Cronbach's  $\alpha$  (0.78) and composite reliability (CR = 0.78) indicated that the questionnaire had good reliability. The average variance extracted (AVE = 0.54) indicated that the questionnaire had good validity. The results of CFA indicated that structural validity of model was acceptable (CFI = 1.000, TLI = 1.000, RMSEA = 0.000, SRMR = 0.000).

#### Questionnaire of Subjective Norms

A questionnaire of home-quarantine subjective norms was used to assess the strength of social pressures on college students to stay at home. Based on Taylor and Todd,<sup>39</sup> this scale was adapted using a 5-point Likert scale, with higher scores indicating a higher level of social pressure to engage in home quarantine. This questionnaire contained two items, such as "My family members and peers think that I should stay at home". After testing the two-tailed Pearson correlation, the scale showed satisfactory reliability and validity (Cronbach's  $\alpha = 0.70$ , CR = 0.74, AVE = 0.59).

#### Questionnaire of Perceived Behavioral Control

A questionnaire of perceived behavioral control was used to assess students' perceived degree of difficulty in performing stay-at-home behaviors. To fit the context of the COVID-19 pandemic, the original questionnaire was adapted;<sup>15</sup> a sample item was "I can stay at home if I want to". This scale used a 5-point Likert scale, with higher scores indicating higher perceived behavioral control regarding home quarantine. The questionnaire presented satisfactory reliability and validity (Cronbach's  $\alpha = 0.84$ , CR = 0.85, AVE = 0.59). The results of CFA indicated that structural validity of model was acceptable (CFI = 0.988, TLI = 0.963, RMSEA = 0.109, SRMR = 0.020).

## Questionnaire of Intention

A questionnaire of intention assessed students' intention to adopt home-quarantine behavior. This questionnaire was adapted from the research of Lu, Zhou, and Wang<sup>38</sup> and has been widely recognized and applied in the prior research (sample item: "I will continue staying at home."). Students responded to the items using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating a higher level of intention to stay at home. The results of the reliability and validity of this scale in the present study were satisfactory (Cronbach's  $\alpha = 0.87$ , CR = 0.88, AVE = 0.70). The results of CFA indicated that structural validity of model was acceptable (CFI = 1.000, TLI = 1.000, RMSEA = 0.000, SRMR = 0.000).

## Questionnaire of Behavioral Outcomes

Home quarantine behavioral outcomes were assessed by a questionnaire of actual home-quarantine behavior adapted from Moon and Kim,<sup>40</sup> and Hong, Liu, Ding, Hwang, Wang and Yang.<sup>7</sup> It contained three items (sample item: "How many times did you go outside of your home each week?"). Each item was scored on a 7-point Likert scale. When the scores were reversed, the higher the score, the higher the frequency of staying at home during the peak of COVID-19. This questionnaire had good reliability and validity in this study (Cronbach's  $\alpha = 0.86$ , CR = 0.87, AVE = 0.69). The results of CFA indicated that structural validity of model was acceptable (CFI = 1.000, TLI = 1.000, RMSEA = 0.000, SRMR = 0.000).

The exploratory factor analysis results showed that the questionnaire has acceptable factorial validity (see Tables 1 and 2). See [Appendix A](#) in Supplementary Material for the full version of the questionnaire.

## Data Analyses

First, we performed an exploratory factor analysis (EFA) to extract factors and conducted a confirmatory factor analysis (CFA) to ensure that reliability and validity of model was acceptable. Second, we used the SPSS 22.0 to calculate the means, standard deviations (SDs), and Pearson correlation coefficients among the variables. Third, we employed a structural equation model (SEM) to test the mediation effect. Finally, on the basis of prior steps, the moderating effect of nationality was examined using Mplus 7.4. Based on the research of Wen et al<sup>41</sup> model fit indicators were used to assess the quality of model, such as the chi-square values ( $\chi^2$ ), the comparative fit index (CFI), the Tucker-Lewis fit index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). According to Hu and Bentler,<sup>42</sup> if the CFI and TLI are above than 0.95 and the RMSEA and SRMR are less than 0.08, then the model is acceptable.

## Results

### Descriptive Statistics

The results of descriptive statistics including mean scores, SDs, and Pearson correlations are shown in Table 3. Means of all variables ranged from 5.42 to 4.16, and SDs ranged from 0.67 to 1.16. In the section of Pearson correlations, attitude was significantly positively correlated with all variables except nationality. Subjective norm was significantly positively correlated with perceived behavioral control, intention, and actual home-quarantine behavior. Perceived behavioral control was significantly positively correlated with intention and behavior and negatively correlated with nationality.

**Table 1** EFA Results of Fitting Index

Model	AIC	BIC	$\chi^2$	df	CFI	TLI	SRMR	RMSEA
One factors	28282.327	28494.628	2100.103	90	0.589	0.521	0.119	0.164
Two factors	26912.220	27190.570	1148.102	76	0.781	0.697	0.060	0.131
Three factors	26153.793	26493.475	683.771	63	0.873	0.789	0.045	0.109
Four factors	25669.400	26065.695	300.631	51	0.949	0.895	0.031	0.077
Five factors	25489.285	25937.476	153.529	40	0.977	0.939	0.017	0.059

**Abbreviations:** AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion;  $\chi^2$ , chi-square values; df, degree of freedom; CFI, the comparative fit index; TLI, the Tucker–Lewis fit index; SRMR, the standardized root mean square residual; RMSEA, the root mean square error of approximation.

**Table 2** Geomin Rotated Loadings of Five Factors

	1	2	3	4	5
Item 1	0.862				
Item 2	0.189				
Item 3	0.948				
Item 4			0.785		
Item 5			0.529		
Item 6		0.776			
Item 7		0.921			
Item 8		0.508			
Item 9		0.551			
Item 10				0.775	
Item 11				0.669	
Item 12				0.903	
Item 13					0.872
Item 14					0.726
Item 15					0.881

**Table 3** Results of Descriptive Statistics

Variables	1	2	3	4	5	6	7	8
1 attitude	–							
2 SN	0.574***	–						
3 PBC	0.595***	0.496***	–					
4 intention	0.697***	0.513***	0.634***	–				
5 behavior	0.259***	0.128***	0.208***	0.313**	–			
6 nationality	–0.005	0.066	–0.082*	–0.032	–0.406***	–		
7 gender	0.080*	0.007	0.055	0.099**	–0.086*	0.232**	–	
8 age	0.097**	0.047	–0.005	0.065	–0.239***	0.569***	0.200***	–
M	4.12	4.01	4.16	4.01	5.42	–	–	21.46
SD	0.72	0.82	0.67	0.80	1.16	–	–	4.20

**Notes:** Gender (0 = male, 1 = female), Nationality (0 = China, 1 = USA). \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Abbreviations:** SN, subjective norms; PBC, perceived behavioral control.

Intention was positively correlated with behavior and gender. It is worth noting that behavior was significantly negatively correlated with nationality, which means that there was a significant difference in actual home-quarantine behavior between college students in China and the United States. Specifically, because higher behavioral scores indicated more frequent engagement in home-quarantine behavior, Chinese college students were more likely to stay at home than their American counterparts.

## The Measurement Model

To ensure the quality of the SEM, measuring the fit indices of the measurement model was crucial. This established a foundation for the follow-up structural model. Based on Hu and Bentler,<sup>42</sup> the results of the measurement model presented a satisfactory model fit,  $\chi^2/df = 332.625/76$ , CFI = 0.968, TLI = 0.955, RMSEA = 0.064, SRMR = 0.048. These indices indicated that the structural model of SEM could be further verified. As shown in Table 4, the results of measurement invariance indicated that the measurement model had strong invariance among Chinese and American students.

**Table 4** Results of Measurement Invariance

	$\chi^2/df$	CFI	TLI	SRMR	RMSEA	RMSEA 90% CI	$\Delta\chi^2/\Delta df$	$\Delta CFI$	$\Delta TLI$	$\Delta SRMR$	$\Delta RMSEA$	$\Delta AIC$	$\Delta BIC$
<b>Model 1: Configural Invariance</b>	435.139/152	0.967	0.955	0.042	0.067	[0.060–0.075]							
<b>Model 2: Metric Invariance</b>	554.766/162	0.954	0.941	0.075	0.077	[0.070–0.084]	119.627/10	-0.013	-0.014	0.033	0.010	99.627	52.486
<b>Model 3: Scalar Invariance</b>	852.545/172	0.921	0.904	0.080	0.098	[0.091–0.105]	297.779/10	-0.033	-0.037	0.005	0.021	277.779	230.637



## The Structural Model

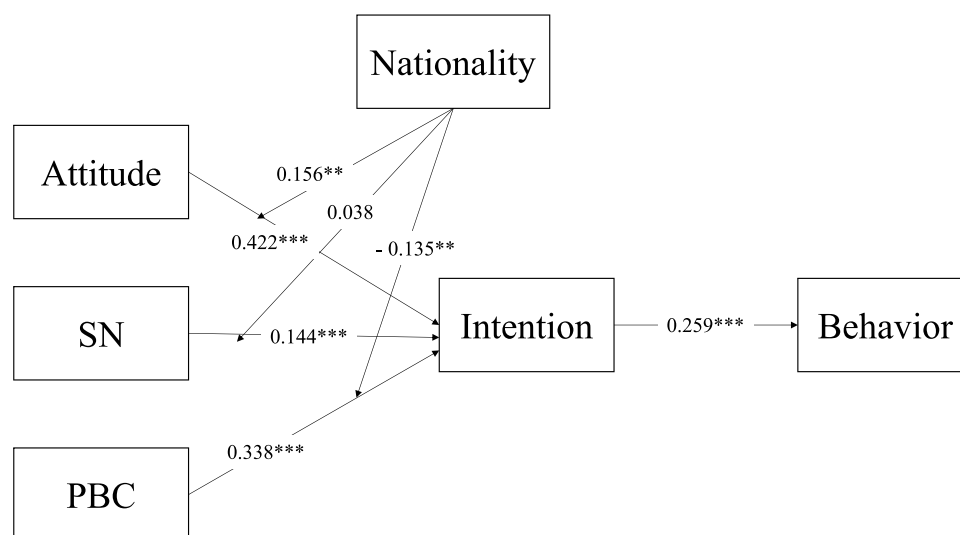
### Results of the Mediation Model

To reveal the influencing mechanism of college students' home-quarantine behavior, the mediation model was built based on the TPB. In this model, the predictive effect of antecedents was explored consisting of attitude, subjective norms, and perceived behavioral control. Meanwhile, the mediating role of intention was tested. As shown in the structural model fitness test results,  $\chi^2/df = 7.883/5$ , CFI = 0.996, TLI = 0.992, RMSEA = 0.026, SRMR = 0.010, the model fit was very good. After controlling for the influence of gender and age, the mediation model indicated that intention was positively associated with behavior ( $\beta = 0.314$ ,  $p < 0.001$ ) (H4). Similarly, attitude ( $\beta = 0.454$ ,  $p < 0.001$ ) (H1), subjective norms ( $\beta = 0.095$ ,  $p < 0.01$ ) (H2), and perceived behavioral control ( $\beta = 0.316$ ,  $p < 0.001$ ) (H3) were positively associated with intention. Furthermore, we tested the mediating effect using the bootstrapping method (setting bootstrap = 1000). The results showed that none of the 95% confidence intervals contained zero (attitude→behavior: [0.099, 0.186]; subjective norms→behavior: [0.007, 0.053]; perceived behavioral control→behavior: [0.067, 0.131]), indicating that intention mediated the association between attitude, subjective norms, perceived behavioral control, and home-quarantine behavior.

### Results of the Moderated Mediation Model

To explore the differences between college students in China and the United States, we further examined whether nationality moderated the relation between attitude, subjective norms, perceived behavioral control, and home-quarantine behavior. According to Wen and Ye,<sup>43</sup> three interaction terms (ie, attitude and nationality, subjective norms and nationality, and perceived behavioral control and nationality) were constructed after standardizing the variables. After controlling for demographic variables, the results of the moderated mediation model displayed a good model fit,  $\chi^2/df = 4.528/3$ , CFI = 0.998, TLI = 0.992, RMSEA = 0.025, SRMR = 0.009. As shown in Figure 2, the interaction term of attitude and nationality predicted intention ( $\beta = 0.156$ ,  $p < 0.01$ ) (H5) and the interaction term of perceived behavioral control and nationality also predicted intention ( $\beta = -0.135$ ,  $p < 0.01$ ) (H7), which meant that nationality moderated the association between attitude and intention as well as the association between perceived behavioral control and intention. However, the interaction term of subjective norms and nationality did not predict intention ( $\beta = 0.038$ ,  $p = 0.311$ ) (H6).

A simple slope analysis was performed to interpret the results of interaction more clearly. According to the type of moderator (ie, Chinese and American nationality), the participants could be divided into two groups. The effects of attitude and perceived behavioral control on intention were examined under different nationality after controlling for age



**Figure 2** The results of the moderated mediation model. \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Abbreviations:** Attitude, home-quarantine attitude; SN, home-quarantine subjective norm; PBC, home-quarantine perceived behavioral control; Intention, home-quarantine intention; behavior, home-quarantine behavior.

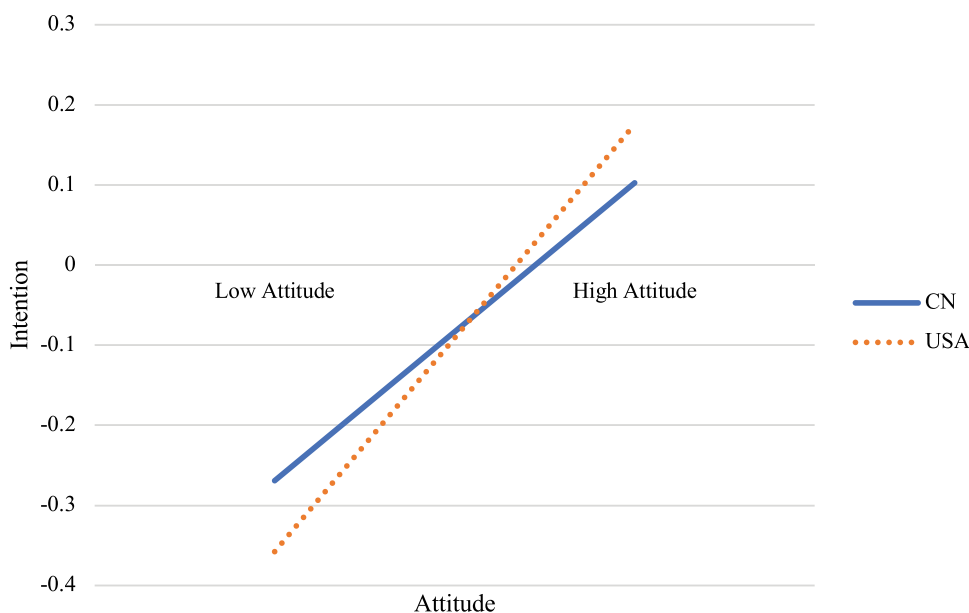
and gender. As shown in Figure 3, in the group of Chinese students, attitude predicted intention (simple slope = 0.259). In the group of American students, attitude also predicted intention but with a higher slope (simple slope = 0.372). Similarly, as shown in Figure 4, in the group of Chinese students, perceived behavioral control could significantly predict intention (simple slope = 0.113). However, perceived behavioral control could not significantly predict intention (simple slope = 0.008) in the group of American college students.

## Discussion

The current study had two main aims. First, we applied the TPB to explore the influential factors and internal mechanism of home-quarantine behavior. Second, we examined the home-quarantine behavior of Chinese and American college students to reveal cross-national differences in this behavior during the COVID-19 epidemic. The results of structural equation modeling combining mediation indicated that attitude, subjective norms, and perceived behavioral control positively predicted home-quarantine behavior through the bridging role of home-quarantine intention. The results of the moderating analysis further revealed that the home-quarantine attitudes of American participants had a stronger association with intention, which could influence actual behavior. However, the home-quarantine perceived behavioral control of Chinese participants had a stronger association with intention compared to American participants. The impact of home-quarantine subjective norms on intention revealed no differences between Chinese and American college students. Our study underscores the potential antecedents and internal processing involved in the execution of actual home-quarantine behavior and illustrates the diverse patterns in collectivist and individualist cultures, respectively. The findings suggest that policy makers and epidemiologists should consider culturally appropriate prevention and control measures to address the COVID-19 pandemic according to their specific national and cultural contexts.

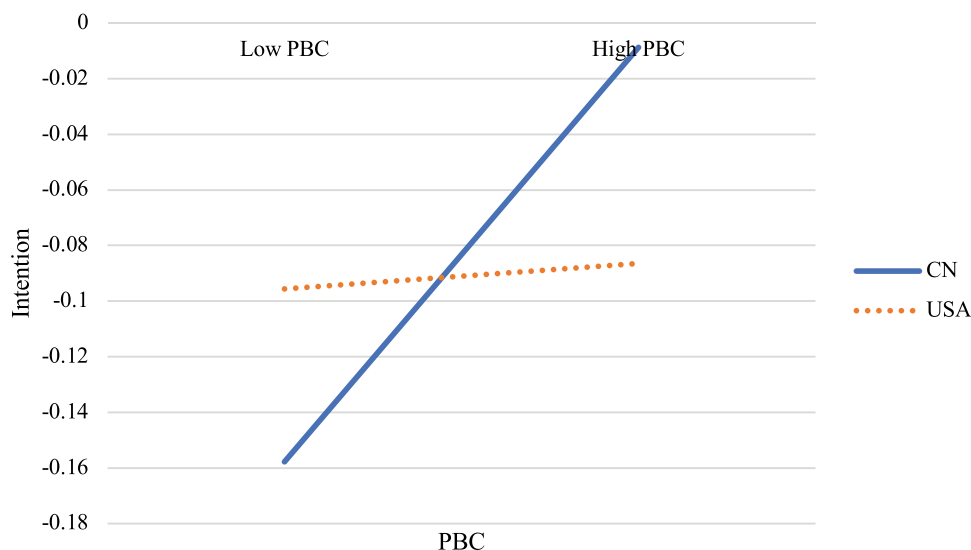
## The Internal Mechanism of Home Quarantine Behavior

The internal mechanism containing antecedents and mediation of home-quarantine behavior was revealed in the current study based on the TPB. First, the results of examining H1, H2, and H3 showed that attitude, subjective norms, and perceived behavioral control of home-quarantine behavior were distal factors that could positively predict actual home-quarantine behavior. Second, the results of examining H4 indicated that home-quarantine intention plays a mediating role between distal factors and actual home-quarantine behavior. This study concurs with the findings of other studies in the field of public health<sup>17</sup> that the dimensions of the TPB (attitudes and subjective norms) have a strong impact on home



**Figure 3** The moderated effect of nationality between attitude and intention.

**Abbreviations:** Attitude, home-quarantine attitude; Intention, home-quarantine intention; CN, China; USA, United States.



**Figure 4** The moderated effect of nationality between PBC and intention.

**Abbreviations:** PBC, home-quarantine perceived behavioral control; Intention, home-quarantine intention; CN, China; USA, United States.

quarantine behavior. In accordance with previous research indicating the positive impact of intention on SARS-preventive behaviors,<sup>15</sup> we also highlighted the motivational influence of behavior. Namely, the intention of home-quarantine is a direct predictor of actual behavior. This study complements relevant evidence regarding social isolation in households.

## Cross-National Differences in Home Quarantine Behavior

Cross-national differences in home quarantine behavior between Chinese and American college students were examined in the current study from the perspective of culture. First, in examining H5, the results showed that home-quarantine attitude had a stronger predictive effect on intention among American participants. According to Hofstede's cultural dimensions theory,<sup>21,24</sup> Chinese and American cultural orientation is rooted in the context of collectivism and individualism, respectively. As attitudes refer to the degree to which a person evaluates the behavior in question in a favorable or unfavorable way,<sup>17</sup> a more favorable attitude tends to produce more efficient effects (eg, personal protective behavior) in individualistic environments. This result is consistent with research in health fields<sup>30</sup> related to the H1N1 flu pandemic. That is, risk perception/attitude had a stronger impact on behavioral intention in the American sample. Regarding a plausible explanation, the “cushion effect” shows that in collectivist societies, collectivists expect other group members to help them cope with the possible adverse consequences of risk, thus weakening the connection between risk perception and behavioral intention.<sup>30</sup>

Second, the results of examining H6 showed that subjective norms revealed no significant predictive difference in intention between the Chinese sample and the American sample. Previous studies<sup>30,32</sup> found that subjective norms had stronger predictive power for a collectivist sample than for an individualist sample; however, our findings indicated that subjective norms had a similar impact on intention. Namely, the predictive power of subjective norms had a comparable impact on intention among American and Chinese participants. Notably, our findings concur with a recent study conducted by Hooft and Jong, who found that individualism did not moderate the relation between subjective norms and intention.<sup>44</sup> That is, the predictive effect of subjective norms on intention did not show a significant discrepancy in different degrees of individualism. Although the effect of subjective norms on intention was generally stronger in a collectivist culture than in an individualist culture, this mechanism may also be determined by other factors, such as economics. In addition to cultural factors, economic background could moderate the predictive effect of norms on intention.<sup>32</sup> Specifically, among more economically deprived populations, norms have a stronger predictive effect on intention in respect to the post-modernization hypothesis,<sup>45</sup> because individuals with sufficient economic resources to

secure their living are more likely to express their intentional thoughts and desires as they have the resources to do so.<sup>46</sup> The remarkable narrowing of the economic gap between China and the United States may be a reasonable explanation. Indeed, China achieved a comprehensive victory in its fight against poverty by 2020, lifting all 98.99 million rural residents out of absolute poverty as defined by China.<sup>47,48</sup> This may be the reason why Chinese and American college students' norms for intention prediction did not differ significantly.

Finally, the results of examining H7 showed that home-quarantine perceived behavioral control had a stronger predictive effect on intention among Chinese participants. Ajzen proposed that the accuracy of perceived behavioral control is constrained by two factors: amount of information about a behavior and availability of resources.<sup>10</sup> First, knowledge is considered a key information resource. Benefiting from China's authoritative and timely media reports, the public received sufficient scientific information, which might make the predictive effect of perceived behavioral control on intention stronger. In contrast, the predictive power of perceived behavioral control may be weakened by heterogeneous and diverse approaches to distribution of COVID-19 news in the media of individualist cultures. Second, home-quarantine perceived behavioral control might be a largely collective effort relying on the social resources and compliance of all individuals. The emergency outbreak of COVID-19 caused a temporary shortage of supplies in most countries. In some collectivist countries, the provision of daily living essential resources coordinated by the local government might make home quarantine more feasible to achieve. Therefore, individuals in the collectivist countries might be more likely to perceive more behavioral control and thus have stronger home-quarantine intention.

## Theoretical and Practical Implications

Taken together, the findings of this study suggest two major implications. From a theoretical perspective, this study examines the cultural context of home-quarantine behavior, an important preventive behavior in response to the COVID-19 pandemic. However, prior research has highlighted the importance of general preventive methods, this study enhances understanding of home-quarantine behavior. Furthermore, the findings revealed the internal mechanism and cross-national differences between Chinese and American college students based on the TPB and cultural dimensions theory. In this way, the findings of this study extended the TPB.

From a practical perspective, the findings underscore the importance of home quarantine in preventing the transmission of the COVID-19 virus and provide additional insights for the implementation of home quarantine. First, national healthcare agencies need to promote the positive attitudes of residents, encourage support from significant others, improve individuals' sense of behavioral control and efficacy, and promote the occurrence and maintenance of home isolation when such a guideline is deemed necessary by public health officials.<sup>49</sup> In addition, it is meaningful to examine cultural contexts, such as whether the public mostly adopts collectivist versus individualist views, in which the home quarantine is implemented. For example, more attention could be addressed to residents' attitude toward home quarantine in the individualist environment, whereas a perceived sense of behavioral control appears to be more relevant in the collectivist context. This will facilitate a more culturally specific and effective impact on home-quarantine behavior, thereby protecting the lives and health of residents.

## Limitations and Future Directions

Several limitations should be noted. First, the sampling range of college students limits the external validity of this study, so it is worth careful consideration when inferring to other populations. Future researchers might expand the age range of the participants. Second, although this study is based on a credible theoretical model, the cross-sectional study design requires caution in inferring causality. Longitudinal study designs and experimental designs can be considered in future studies to better reveal causality. As a kind of protective behavior, the influencing factors for home quarantine may be complex, and this study is based on the existing theoretical perspective. In the future, more factors can be considered from other perspectives in addition to cultural differences. For example, consideration of different collectivist-individualist values among different ethnic groups or different states within the same country.<sup>29</sup>

## Conclusion

Through a cross-national investigation, this study revealed the internal mechanism of home-quarantine behavior, clarified cross-cultural differences, complemented the existing theory, and provided insights for practical applications. First, attitude, subjective norm, and perceived behavioral control were remote factors affecting home quarantine, and intention played a bridging role between these remote factors and practical behaviors. Second, attitude had a stronger predictive effect on intention among American participants, whereas the relation between perceived behavioral control and intention had a stronger correlation among Chinese participants. There was no difference in the predictive power of subjective norms regarding intention among these two samples. The above findings expand the external validity of planned behavior theory in home-quarantine behavior, and cross-cultural differences during the pandemic. Finally, this study suggests that practitioners and public health officials should promote culturally specific practices when home quarantine guidelines are recommended.

## Abbreviations

TPB, theory of planned behavior; SN, home-quarantine subjective norm; PBC, home-quarantine perceived behavioral control; SARS, severe acute respiratory syndrome.

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The authors report no conflicts of interest in this work.

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