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I belong, therefore I am: The role of economic culture in compliance with COVID-19 preventive measures

Heng Li

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I belong, therefore I am: The role of economic culture in compliance with COVID-19 preventive measures

Heng Li

Sichuan International Studies University, China

Authors' Contributions Single author contribution.

Corresponding author:
Heng Li
Sichuan International Studies University
Chongqing, China
400715
leehem168@163.com
Phone: 86-18652262362

Abstract

Cultural orientations in relation to individualism and collectivism produced by subsistence strategies can lead to a wide array of consequences for perception, cognition, and emotion. We predict that, as a result of different economic patterns, farmers with greater collectivism would show more compliance with COVID-19 precautionary behavior than herders with greater individualism. By adopting a "just minimal difference" approach, we compared Chinese farming and herding communities that share a national identity, ethnicity, and residential area but vary in their degree of individualism-collectivism. Consistent with our hypothesis, Study 1 found that farmers reported higher compliance with prevention initiatives than herders in self-report survey. Study 2 provided a behavioral choice confirmation of the observed relationship. The present research provides the empirical evidence that economic activities can have divergent effects on mitigation strategies in the COVID-19 fight, and these results have meaningful implications for socioecological psychology

theory and for pandemic prevention and control.

Keywords:

socioecological psychology; cultural psychology; Chinese; farmers; herders; COVID-19; preventive measures; behavioral outcomes

Introduction

The new coronavirus disease (COVID-19) is sweeping the globe and already ranks among the world's deadliest epidemics. Recently, a wealth of empirical studies have revealed that a variety of physical, psychological, social, and environmental factors systematically influence how people comply with protective behaviors during COVID-19 (de León-Martínez et al., 2020; Li, 2021; Hartmann & Müller, 2022; Tepe & Karakulak, 2023). For example, emerging findings from psychological research show that culture plays an important role in individuals' abidance to COVID-19-related public health measures (Chen & Biswas, 2022; Gokmen et al., 2021; English et al., 2022; Jovančević & Milićević, 2020; Li & Cao, 2022). For example, based on data sets from the Google community mobility reports regarding how communities move around differently, and from the Hofstede's culture dimensions of 58 countries during the early phase of COVID-19, Huynh (2020) found that people in countries with higher level of uncertainty avoidance were more likely to adopt practices of social distancing even controlling for nuisance variables, such as wealth status and GDP per capital.

Cultural determinants of adherence to COVID-19 protocols

However, culture varies along several fundamental dimensions including analytic and holistic thinking styles (Nisbett & Miyamoto, 2005), societal tightness-looseness (Gelfand et al., 2006),

relational mobility (Yuki & Schug, 2012), and honor (Cohen et al., 2006). Of these, cultural orientations in relation to independence/individualism versus interdependence/collectivism have received much attention in the empirical literature (Gudykunst et al., 1996; Hui & Triandis, 1986; Oyserman & Lee, 2008). An increasing number of studies devoted to understanding cultural determinants of compliance with COVID-19 policies and procedures have focused on the role of collectivistic values (Huang et al., 2020; Na et al., 2021). For example, in a large scale study involving a series of datasets about face mask usage and public health awareness, along with several proxy indicators for collectivism within the United States and 67 countries throughout the world, Lu et al. (2021) found that collectivism scores were a significantly positive predictor of mask usage even when including many extraneous variables (e.g., political orientation, demographics, and health factors) as covariates. Thus, these findings stress the importance of social and cultural syndromes of collectivism in the response to the current pandemic.

Despite Lu et al.'s (2021) study providing consistent evidence for the robust link between collectivism and mask usage, several limitations to this study warrant specific mention. First, although wearing a well-fitted mask in public places is important to prevent the spread of the novel coronavirus disease, it is unclear whether varying degrees of collectivism are also associated with a more comprehensive strategy of precautionary measures to suppress transmission, such as social distancing and quarantining. Second, even though many confounding factors are controlled for in Lu et al. (2021), there are still a host of potential confounds or unidentified factors that are beyond the control of experimenters. Thus, it would be preferable to seek much more comparable sampling populations who share many common cultural and social patterns, while differing to the extent possible only in cultural collectivism.

Ecocultural basis of cognition

In the current research, we compared the tendency to comply with COVID-19 transmission mitigation behavioral guidelines between two subsistence groups in southwest China whose daily economic activities afford different degrees of collectivism. Specifically, farmers in this region use their small to medium-sized land holdings to cultivate seasonal cash crops, such as pear and grape for economic purposes. They harvest fruits during the ideal periods with parents, siblings, spouse, and children of their immediate families or members of extended family households (Li & Cao, 2019). In the prime harvest season, farmers in those villages coordinate tasks, such as setting up a team to check on their crops on a regular basis in case that fruits are stolen from their orchards. Furthermore, given that there might be no right amount of seasonal rainfall or flooding during the growing season, local governments coordinate efforts to set up an entire and intensive irrigation network. This big construction and maintenance work is spread out over multiple families and requires them to actively coordinate. Thus, these high levels of cooperative labor exchanges and interdependencies existing in work practices may contribute to a more salient orientation toward collectivistic tendencies as the rice theory findings suggest (Talhelm et al., 2014; Talhelm & Oishi, 2018).

By contrast, herders reside in the same geographic area but raise rabbits and chickens for their livelihood[1]. A common scenario is that a human caretaker is responsible for a flock of backyard chickens or a herd of rabbits. Compared to farming, herding rabbits or chickens does not require a large amount of manual labor to produce its goods (Li & Cao, 2019). For example, herders only

[1] We use the term "herding" in the sense of the American Heritage Dictionary's definition of, "a large group of animals⋯kept together as livestock." However, we point out that the herders do not move their rabbits from field to field, as with sheep or cattle. The mobility may be an important part of herding culture that is absent here. However, raising livestock like this still involves no irrigation systems and less labor sharing than crops like rice, which are important components of the interdependence of farming.

need to spend two hours feeding the chickens with pellets made with protein, supplements, and crushed grain twice a day. This means that herders can complete their workload by themselves rather than share their duties between families/neighbors. Thus, working self-sufficiently and lower need for cooperation in their economic activities between nuclear family units are likely to foster individualistic or independent social orientations in herders (Uskul & Over, 2018).

Past work has indeed shown that farmers tend to adopt a more collectivist culture and exhibit a high degree of social interdependence than other subsistence groups in many parts of the world (Ang et al., 2021; but see Talhelm et al., 2014 for a more nuanced view). This strong collectivistic orientation may cause farmers to place more socialization emphasis on compliance in child-rearing goals and practices (Barry et al., 1959; Mishra & Berry, 2017); to have a less painful feeling in the face of social ostracism (Over & Uskul, 2016)[2]; and to show a stronger holistic cognitive tendencies in attention, categorization, and reasoning (Berry, 1967). By contrast, herders tend to score higher on the broad dimensions of individualism and social independence (Witkin, 1979). This strong individualistic orientation may cause herders to have a more intensely painful feeling in the face of social ostracism (Over & Uskul, 2016); to show higher levels of self-esteem, assertiveness, and more curiosity in child-rearing practices (Barry et al., 1959); and to demonstrate a stronger analytic cognitive tendencies (Üskül et al., 2008).

Theoretical grounds and hypotheses development

To sum up, the findings of the various studies in the past few decades have yielded evidence that subsistence activities are likely to have a broad range of consequence for perception, cognition,

[2] The reason is that, in their study, the ostracism came from a stranger. People in collectivistic cultures care less about strangers, so the ostracism hurts people in collectivistic cultures less. In contrast, people in individualistic cultures are more likely to make friends with strangers and interact with strangers, so the ostracism hurts more for people in individualistic cultures. That explains why the ostracism hurt more for the people in the farming community than in the herding community.

emotion, and motivation (Berry, 2018; Uskul & Oishi, 2020). However, to this day there is a paucity of information available regarding how these socioecological features impact people's compliance with preventive measures surrounding the COVID-19. One stream of research on cultural psychology is the work on the role of economic culture in conformity behavior (Berry, 1993, 1994). Reasoning that relying solely upon hunting and fishing for livelihood would encourage greater individualism in Eskimo people, while harmonious group collaboration in rice harvesting would foster greater collectivism in Temne people, Berry (1967) hypothesized that these two groups of people should demonstrate difference in conformity since they vary systematically by the degree of individualism-collectivism. Consistent with this prediction, the researcher found that Temne people tended to show greater conformity to group norms in a line length judgement task even if the norms were incorrect, while Eskimo people demonstrated a preference for independent decision-making in the same task (Berry, 1967; Barry et al., 1959). Such findings suggest that people's conformity to rules that prescribe certain conduct as acceptable may vary as a function of the degree of food accumulation and socialization process.

Despite this empirical study providing novel insight into the association between economic activities and people's conformity behavior in indigenous societies, there is limited evidence regarding whether these findings can be replicated independently within the same ecocultural tradition in urban industrialized societies. In addition, it is unclear whether individuals who employ different subsistence strategies would show varying degrees of compliance with COVID-19 related health behaviors in natural settings in addition to the visuospatial line judgment task in the laboratory.

Overview of The Present Research

Integrating two lines of work - research on the predicting role of collectivism in the pandemic

response and research on the link between collectivism and conformity, we proposed the primary hypothesis that farmers would show higher level of compliance with public health policies in times of COVID-19 than herders, and the mediator hypothesis that individualism-collectivism should mediate this association. We conducted two studies to test our predictions. Study 1 involves a self-report survey exploring whether farming and herding communities in southwest China show different degrees of abidance in preventive measures against the pandemic. In Study 2, we sought to determine if the observed effect in Study 1 would occur in a behavioral encounter. Across two studies, we tested individualism-collectivism as a potential mediator of the association between economic culture and compliance with preventive measures. Note that both Studies 1 and 2 took place in early January, 2022. There were no confirmed cases in this area or no new confirmed cases for 14 consecutive days during the experimental session. Thus, it is unlikely that the new coronavirus situation influenced the results.

The regions of Huaying county in Sichuan province were selected as the research site based on the official data and knowledge gathered from relevant government offices (see Figure 1). In the past few years, the local government has been boosting productivity and competitiveness in the agriculture sector (Li & Cao, 2019). For example, as one of the well-known products of modern agriculture in Huaying prefecture, after more than twenty years of development, the honey pear industry has sprung up nationwide. Meanwhile, the city government aims to develop a rabbit industry that is recognized as one of the major livestock industries in this country. Nowadays, rabbit farming has grown from raising a few rabbits for family consumption to large commercial operations with hundreds of rabbits. Encouraged by this policy, some people in rural areas used their farmlands to build rabbit houses for herding. Thus, herders did not engage in the same farming

activities, such as growing crops or fruits, as the farmers did in the present research. Because the two groups whose subsistence styles exogenously vary with respect to collectivism/individualism, it provides a valuable natural testbed for comparing differences in compliance with COVI-19 mitigation measures between farmers and herders.

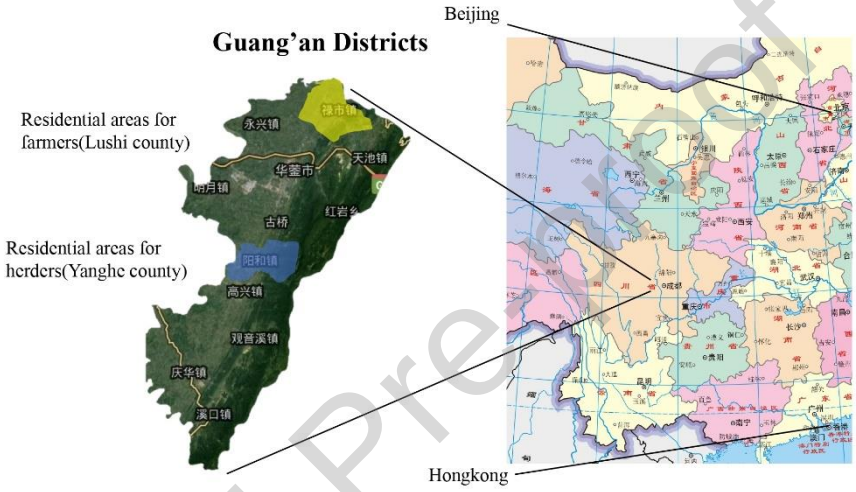

Figure 1 The research sites are located in eastern Sichuan province.

Study 1

Method

Participants

After conversations with officials in local government offices, we were told that the total number of herders in this area was smaller than the number of farmers. Since herders were relatively small in number that required additional efforts to reach them, the researchers first recruited participants from the herding communities. Subsequently, we selected a comparison group of farmers, closely matched with herders for the demographic profile (e.g., age, gender, and many other characteristics). We asked local search assistants to adopt a "random walk" door-to-door recruitment

strategy to obtain random community samples for participation in our study. Participants were informed that their responses would be processed anonymously and confidential, and they were free to withdraw at any time.

A total of 147 farmers and 121 herders in 8 local villages of Lushi and Yanghe counties agreed to take part in our survey for a monetary reward. All of them belonged to Chinese Han ethnic group. To minimize the influence of the residential self-selection bias in which individuals may consciously choose to live in a place, we only included participants who grew up in the research site and spent a formative period of their lives there. Participants in the two subsistence groups showed no differences in a set of sociodemographic characteristics, such as age, gender, educational level, monthly family earnings, and civil status, that may impact their pandemic response strategies (Table 1). This "just a minimal difference" approach provides a unique natural experimental setting for our theoretical perspective (Uskul et al., 2008; Li, 2021), because members of farming and herding communities belong to the same group in terms of nationality, ethnicity, language, and geographical region of habitat and yet vary in their degree of economic demands and orientations toward individualism or collectivism.

Table 1 Sample characteristics of participants in Study 1

Group	Age	Educational level	Gender	Income level	Civil status
Farmers (N = 147)	44.3 (12.5)	Junior middle school 39.5% High school 46.3%	45.6% females	≤2500 RMB 53.7% 2500-3200 RMB	Single 18.4% Married 81.6%

		60.5%			
		Junior middle		≤2500 RMB 51.2%	Single 12.4%
Herders		school 41.3%	54.5%	2500-3200 RMB	Married
	46.1 (13.3)				
(N = 121)		High school	females	48.8%	87.6%
		58.7%			

Materials and procedure

Participants were tested individually in home or workplace settings. Following a series of socio-demographic questions, participants were asked to completed a sociogram task that was used to measure their implicit individualism-collectivism (Dong et al., 2018; Kitayama et al., 2009). In that task, participants draw a community structure to explain the interconnections between themselves and their friends. They wrote "我(me)" in the central circle and used different circles to denote each friend with 1, 2, 3, and so on. They were asked to indicate each friend's gender with 男 for male friends and 女 for female friends (see Figure 2). Participants were allowed to draw however many friends they desired. They could also connect as many circles as they wanted and depict a proper sociogram to represent the links among people and the individuals' relationship dynamics. We used the following formula, which modeled after Talhelm et al. (2014), to calculate implicit individualism (or self-inflation):

implicit individualism/self-inflation = the size of the self − the average size of friends

Higher values indicate greater levels of individualism and lower values represent greater levels of implicit collectivism.

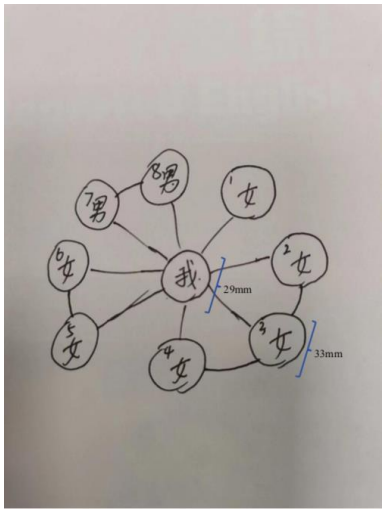

Figure 2. In the Sociogram task, participants in Study 1 draw circles to represent the self and friends

Next, participants completed a six-item questionnaire that was used to assess precaution measures surrounding COVID-19 in the general public. The six generic preventive practices (following physical distancing, using a face mask, practising respiratory hygiene, monitoring one's own health and contacting health service for any signs of a coronavirus infection, doing hand washing, and ensuring proper ventilation with outside air) were issued by the local government. Residents were required to strictly follow these public health measures to tackle the transmission of the virus.

Participants were asked to rate each item on a 5-point Likert scale from 1 (*not at all*) to 5 (*always*). Higher scores indicate greater levels of compliance with COVID-19 guidelines. The Cronbach's alpha of the questionnaire in the current study was 0.80. The high value of α indicates that the questionnaire has adequate internal consistency. We averaged the six items to create an overall index of adherence to these preventive measures. Finally, participants were offered an opportunity to figure out the true nature of the survey. After receiving the debriefing procedure, participants were told the true purpose of the experiment.

Results and discussion

Responses in all debriefings indicated that no participants were aware of the true focus of the study. Farmer and herder participants showed the already high motivation to abide by COVID-19 precautionary measures; both means differed significantly from the scale midpoint, $|t|$s = 16.79-23.60, *ps* < .001. Additionally, there were quantitative variations between these two types of subsistence groups. In line with our main prediction, Chinese farmers self-reported compliance scores on preventive measures against COVID-19 (M = 3.92, SD = 0.73) were higher than Chinese herders (M = 3.57, SD = 0.70), $t(266) = 3.92$, $p < .001$, Cohen's d = 0.48, 95% confidence interval [CI] = [0.1714, 0.5175][3](Figure 3a). Note that the statistical differences remained after controlling for several demographic variables (see Tables 1-4 in Supplementary Materials for more details about the two studies). Thus, Study 1 provided initial support that the overall levels of health behavior endorsement in farmers were significantly higher than those of herders. More information about differences in single-item measures of adherence to COVID-19 regulations can be found in Table 5 of Supplementary Materials.

a. **b.**

[3] All reported results in Studies 1 and 2 remained substantively unchanged when we included the individual-level control variables (all *ps* < .05).

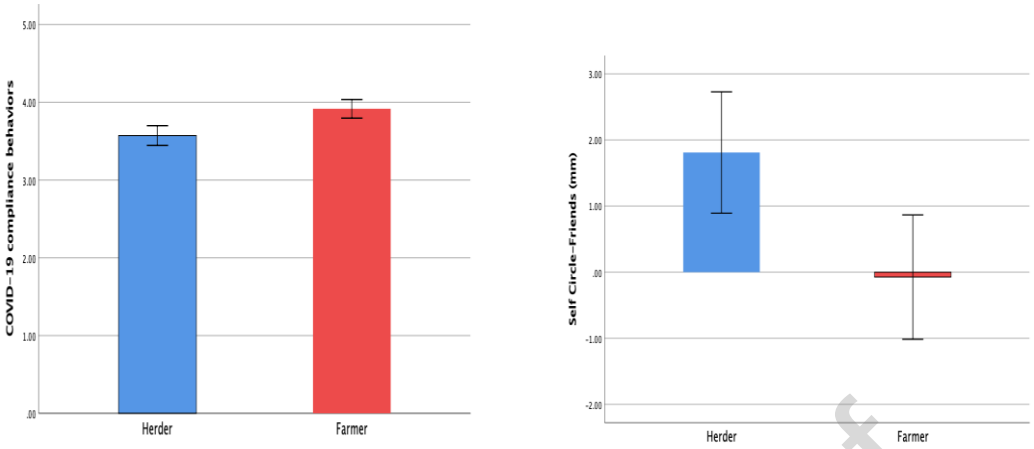

Fig.3 Results of Study 1: farmers showed higher levels of compliance with COVID-19 preventive measures (a) and self-inflated less than herders (b). Error bars show standard errors of the mean.

Consistent with our mediation hypothesis, herder participants (M = 1.81, SD = 5.05) showed a higher level of individualism (self-inflation in millimeters) than farmer participants (M = -0.07, SD = 5.70), t (266) = 2.83, p = .005, Cohen's d = .35, 95%CI = [0.5711, 3.1887](Fig. 3b). Comparing the circles for self and friends separately, herders (M = 30.91, SD = 4.35) and farmers (M = 30.24, SD = 3.85) used circles with similar sizes to represent the self , t (266) = 1.34, p = .18. But farmers (M = 30.32, SD = 4.67) used larger circles to draw friends than herders (M = 29.10, SD = 4.01) , t (266) = 2.27, p = .02, Cohen's d = .28, 95%CI = [0.1610, 2.2806]. A 5,000- sample bootstrap mediation analysis using PROCESS model 4 (Hayes, 2013) revealed that individualism-collectivism mediated the association between economic culture and compliance with preventive measures surrounding the COVID-19 pandemic (95% CI = [-0.1937, -0.0327]) (see Figure 4).

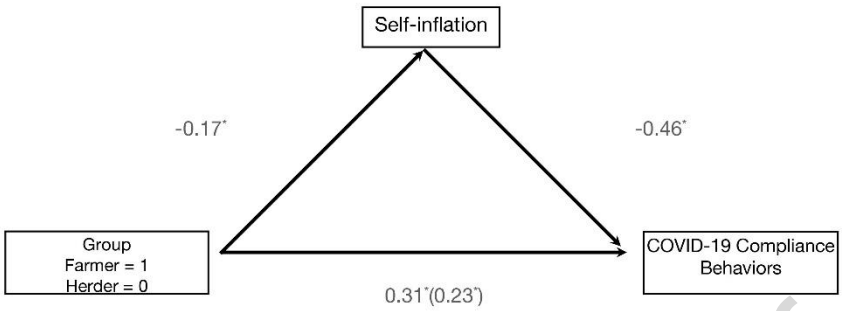

Fig. 4. Mediation model showing the effect of cultural groups on COVID-19 compliance behaviors, as mediated by self-inflation (Study 1). Along the bottom path, the value outside of the parentheses indicates the total effect, and the value inside parentheses represents the direct effect after controlling for the mediator. Asterisks indicate significant paths ($p < .01$). Note that the mediation analysis does not include control variables.

These findings fit with the theorizing that harmonious group coordination in farmers' economic livelihood encourages more collectivistic values than herders' economic activities and this difference may play a role in these two types of communities' responses to mitigation measures towards the COVID-19 pandemic. One limitation of Study 1 is that the wordings we used to ask about COVID-19 prevention measures were written in the formal wordings of government communications. It is possible that some participants did not fully understand the wordings. In addition, Study 1 heavily relied on self-report data to assess compliance with various tiers of public health interventions. Some critics may voice their concerns about whether these findings can truly reflect real-world behaviors (Campbell & Reiman, 2022). To address these issues, we used more effortful observation of behavior in naturalistic settings to investigate differences in abidance of

COVID-19 preventive measures by farmers and herders.

Study 2

Method

Participants

The recruitment and screening procedures of Study 2 were identical to those of Study 1. 122 farmers and 104 herders in 8 local villages of Lushi and Yanghe counties agreed to take part in our study for a financial reward. All of them belonged to Chinese Han ethnic group. Participants in the two communities showed no differences in a set of sociodemographic characteristics, such as age, gender, educational level, monthly family earnings, and civil status, that may impact their pandemic response strategies (Table 2).

Table 2 Sample characteristics of participants in Study 2

Group	Age	Educational level	Gender	Income level	Civil status
Farmers (N = 122)	44.1 (10.6)	Junior middle school 36.1% High school 63.9%	45.1% females	≤2500 RMB 60.7% 2500-3200 RMB 39.3%	Single 13.1% Married 86.9%
Herders	45.7 (11.3)	Junior middle	56.7%	≤2500 RMB 59.6%	Single 12.5%

(N = 104)	school 40.4%	females	2500-3200 RMB	Married
	High school		40.4%	87.5%
	59.6%			

Materials and procedure

Following Li (2021) and Li and Cao (2022), all measures were implemented by research assistants who were unaware of the present study's true hypotheses. The confederate greeted participants on the ground floor and provided them with a summary of the steps that were used in the survey. After this, participants were asked to completed the same sociogram task as Study 1. Subsequently, they were told that the test room was located at the third floor and they needed to take the elevator to upstairs. A dispensers for hand sanitizer gel was placed on the main entrance to the laboratory (about 15 feet to the left or right of the door) to make sure that each participants had access to it. Participants were requested to follow laboratory hygiene rules and to utilize the squeeze-type dispensers to prevent the spread of germs and viruses during the pandemic before entering the test room. Another trained research assistant at the reception desk recorded participants' hand hygiene behavior during the study session without drawing their attention.

After entering the test room, participants were given an unrelated questionnaire that was used to test their general knowledge. Next, they were asked whether they could recall laboratory hygiene rules informed by the research assistant. Finally, participants were debriefed about the the nature and purpose of the study.

Results and discussion

All participants accurately recalled the information regarding hand hygiene requirements.

Responses in all debriefings indicated that no participants issued suspicions about the primary hypothesis of the study. A vast majority of farmer participants (101 of 122 or 82.8%) sanitized their hands as requested before walking into the test room. A significant percentage of herder participants (69 of 104 or 66.3%) also washed their hands as requested before walking into the test room. In order to ascertain if there was a significant difference in the rigorous abidance of the hygienic-sanitary norms, we used a dichotomous logistic regression model with hand washing behaviors (practising hand hygiene = 1 vs. not practising hand hygiene = 0) as the dependent variable. In line with our focal prediction, farmers were more likely to follow hand washing policies than herders, Nagelkerke R^2 = .06, Wald (df = 1) = 8.48, p = .004, odds ratio = 2.51 (95% confidence interval [CI] = 1.351, 4.661)(Figure 5). Thus, Study 2 provided a behavioral choice confirmation of the association between economic culture and public health compliance.

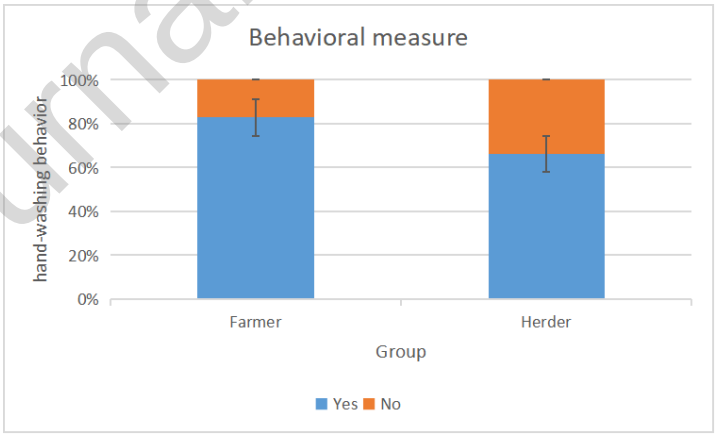

Fig. 5 The percentage of hand-washing behavior is shown separately for farmers and herders. Error bars show standard errors of the mean.

In line with our mediation hypothesis, herder participants (M = 2.07, SD = 6.72) showed a higher level of individualism (self-inflation) than farmer participants (M = 0.07, SD = 5.77), t (224)

= 2.41, p = .017, Cohen's d = .32, 95%CI = [0.3636, 3.6398] (see Figure 6). Comparing the circles for self and friends separately, herders (M = 31.05, SD = 4.63) and farmers (M = 30.40, SD = 4.73) used circles with similar sizes to represent the self , t (224) = 1.03, p = .0.30. But farmers used larger circles (M = 30.34, SD = 4.73) to draw friends than herders (M = 28.98, SD = 4.44), t (224) = 2.32, p = .02, Cohen's d = .31, 95%CI = [0.2058, 2.5048].

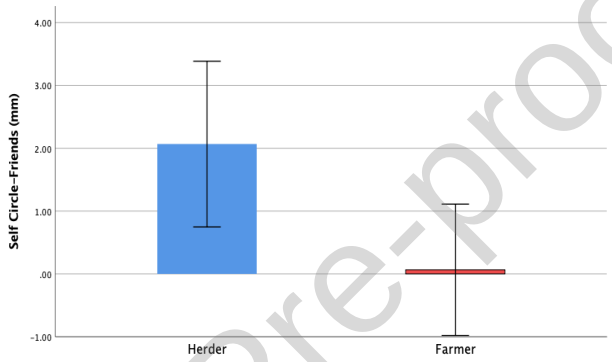

Fig. 6 farmers self-inflated less and herders in Study 2. Error bars show standard errors of the mean.

A 5,000- sample bootstrap mediation analysis using PROCESS model 4 (Hayes, 2013) revealed that individualism-collectivism mediated the association between economic culture and compliance with preventive measures surrounding the COVID-19 pandemic (95% CI = [-0.8765, -0.0800])(see Figure 7).

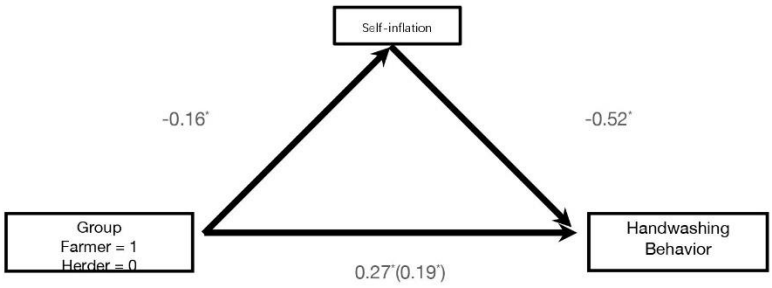

Fig. 7. Mediation model showing the effect of cultural groups on hand-washing behavior, as mediated by self-inflation (Study 2). Along the bottom path, the value outside of the parentheses indicates the total effect, and the value inside parentheses represents the direct effect after controlling for the mediator. Asterisks indicate significant paths ($p < .01$). Note that the mediation analysis does not include control variables.

General discussion

Culturally distinct groups live in different physical and ecological environments (Edgerton, 1971; Stern et al., 1995). These ecological niches are central to economic activity and growth, which, in turn, provide rich sources of information for cognitive characteristics and development (Berry, 2018; Harati & Talhelm, 2023). The current research examined how an important dimension of ecocultural environment, namely economic strategies, was associated with people's compliance with COVID-19 preventive measures. It is argued that ecocultural systems that encourage collectivism (e.g., farming) are linked to better abidance of the compliance protocols than those encouraging individualism (e.g., herding). Consistent with this assertion, Study 1 found that two communities that varied in their degree of farming versus herding subsistance economic activities

showed different levels of compliance with the COVID-19 preventive behavioral guidelines in their self-report. Study 2 replicated this findings in an ecological natural setting. The results showed that farmers were more likely to practise hand hygiene than herders (Study 2). Across the two studies, we found that cultural values of individualism-collectivism play a mediating role in accounting for the relationship between economic culture and compliance with preventive measures. Overall, these findings offer converging evidence for the notion that the display of health-related behavior varies as a function of the process of group adaption to ecological circumstances.

These findings contribute to the existing literature in several important aspects. First, our finding show that the effect of subsistence strategies on social orientations toward collectivism/individualism may translate into high emphasis on abidance to COVID-19 preventive measures that are not directly associated with a particular subsistence activity. These patterns of relationships that we found are in agreement with, and are predicted from previous research showing that this kind of compliance or conformity is not restricted to economic activities (Berry, 1967). For example, Nisbett and Miyamoto (2005) contend that any practice and conducts involve a set of rules or principles may have the same potential of triggering corresponding and systematic biases beyond its original contexts. For example, Li and Cao (2019) found that compared with herders who had more manual availability in the accommodation of livestock husbandry, farmers who engaged in heavy manual work in intensive subsistence farming tended to produce more non-manual pointing gestures in a referential communication task that is unrelated to any economic activities. These findings suggest that the basic economic practice, traits, and system of a cultural group may play important roles in the emergence of behavioral feature of its members. However, no touchstone research is available to corroborate whether carrying out specific economic roles influences people's

health decision making and cognition. The current research extends this literature by showing that economic culture can also have a long-lasting impact on health-decision making process.

Second, although much research has showed cross-cultural difference in compliance with precautions compliance, the underlying basic cognitive processes contributing to this variability are inherently uninterpretable. Indeed, systematic differences between the two cultural groups could be attributed to a myriad of factors, such as social norms, relational mobility, and thinking style. Due to correlational research design of past work, it is not possible to draw clear conclusions concerning the relative contributions of different potential explanatory factors to cross-cultural variability in public health adherence. By addressing this methodological shortcoming, we compared two types of rural communities who were as closely matched as possible while controlling for as many confounding group-level differences within the same geographical location as possible. Although this study design that employs a closely matched companions still does not allow us to determine the causal role of economic culture, we can at least dismiss the systematic patterns of variation in health-related behavior as a mere coincidence or random links.

Finally, although some research has indeed shown that farmers and herders show systematic differences in perception, learning, and categorization as a result of their economic structures, most previous studies were carried out in remote and indigenous societies with a relative small populations size (e.g., Arctic, Northern Ireland, Turkey) (Berry, 1967; Uskul et al., 2008). The present work adds to the existing database that the differences in health behavior associated with economic culture can also observed in a urban industrialized society with a large population (e.g., China). This provides an ideal natural setting for future ecocultural research on cognition and social behavior because China has over 300 million farmers (200 million farming households) (National

Bureau of Statistics of China, 2008).

It is important to point to some potential limitations of our investigation, which provide several fruitful avenues for future research. First, the random walk methodology and snowball sampling may be particularly efficient and effective in the recruitment of members of rural communities, because population and telephone listings are unavailable (Flynn et al., 2016). However, the inclusion of people who only participated in the study represents a self-selected sample and would bias the effect size estimation of the prediction model. Future research refining the approach for use in participants recruitment, such as promoting the cooperation efforts with local government, may allow researchers to make claims to a greater level of generality from a particular sample.

Second, our participants represent a clear sample of population outside of North American and Europe, and of prototypical Western context. However, we only sampled irrigation agriculturalists in southwestern China where rice has been central for feeding the majority of the population. Previous research has shown that Chinese southern rice farmers are more collectivistic and show more holistic thinking than northern wheat farmers due to their different economic strategies (Talhelm, et al., 2014). Thus, it is unclear whether our research results can generalize to agricultural samples beyond China, or even to other regions of China. Talhelm et al. (2022) found that strong social norms and low relational mobility associated with traditional rice farming predicted better COVID-19 outcomes (e.g., lower death rates) at both national and international levels. Thus, conducting large-scale study on the relationship presented here within China or even at a global level in future research would be valuable.

Third, the current research only investigated how directly engaging in particular economic activities leads to differences in response to the COVID-19 pandemic. However, Over and Uskul

(2016) found that the influence of economic subsistence activities on responses to social exclusion can extend beyond the adults engaging in local agriculture markets to influence even the community's children who never farm or herd for a living. Thus, it would be valuable to investigate whether the youngest members from farming and herding communities demonstrate the same difference in public health preventive measures in future studies.

Finally, given that the present research is observational in nature, we cannot completely exclude the potential effects of self-selection to engage in certain economic activities and to live in a chosen ecoculture. For example, it may be that people prioritizing collectivistic values are more likely to choose to become active farmers rather than herders. Due to time pressure and financial constraints, we did not controlled for many confounding variables that may influence subsistence strategies. Future research integrating other documented influences on economic activities and on adherence to COVID-19 regulations will allow for the use of more sophisticated testing procedures, which could perhaps improve the amount of variance explained in performance variance.

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Data Availability Statement

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

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