The role of cosmopolitan orientation in COVID-19-related attitudes: Perceived threats and opportunities, vaccination willingness, and support for collective containment efforts

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Abstract: Cosmopolitan individuals identify themselves as "citizens of the world." In the present research, we tested the idea that endorsing a cosmopolitan orientation (CO) is adaptive in the COVID-19 crisis. Cosmopolitan individuals more readily transcend national parochialism, show greater concern for all humanity, and prioritize collective interests. In a two-wave multi-region investigation with six samples from China, Hong Kong, Taiwan, Malaysia, Singapore, and the U.S., we first established longitudinal and cross-cultural measurement invariance of the CO scale. Next, we found that people with a higher CO tended to perceive over time a greater threat posed by COVID-19, take more safety measures, advocate collaboration to contain the pandemic and see opportunities for positive change brought about by COVID-19 (e.g., environmental sustainability). Higher CO was also associated with a greater willingness to be vaccinated and a greater support for collective containment efforts. Analyses also revealed these effects to be largely generalizable across regions, thus lending strong support for the pancultural function of CO in promoting the resilience of humanity in the trying times of the COVID-19 crisis. The materials, raw dataset, and analytic code for the current study are available at
https://osf.io/pqvut/?view_only=e2419d8c26534fc19e6f91433fdbfeed.

Keywords: Cosmopolitan orientation, Global consciousness, Pancultural, COVID-19, Vaccine, Environmental sustainability

The COVID-19 pandemic has disrupted the lives of many. As of April 2023, COVID-19 had infected over 762 million people and claimed over six million lives worldwide (World Health Organization [WHO], 2022). Many others have become unemployed (Blustein et al., 2020), socially isolated (Loades et al., 2020), and psychologically fatigued from the restrictions imposed to limit the contagion of the disease (Michie et al., 2020). Relative to previous pandemics, the COVID-19 virus has higher transmission rates (Wilder-Smith et al., 2020) and a longer incubation period (Cheng et al., 2021), making it difficult to identify and isolate infected people early. Despite global efforts to contain the pandemic, the fast transmission and frequent surge of COVID-19 cases (WHO, 2022) has led to social distancing measures, city lockdowns, and strict travel restrictions by many countries in the past three years.

Inevitably, it is extremely challenging to contain the spread of the highly transmissible virus in an interconnected

world. Many experts have advocated the importance of collaborative efforts both within and between countries to effectively curb the virus spread (e.g., Organization for Economic Co-operation and Development [OCED], 2020). Individuals need to place aside their personal interests and comply with safety measures for the collective good (Naso, 2020; Yong & Choy, 2021). Governments need to think beyond national interests and seek multilateral collaboration between countries to respond to public health emergencies, contain the scale of global outbreaks, and manage the economic impacts of the pandemic more effectively (e.g., disruptions in the global supply chain; Aday & Aday, 2020; Amaya & De Lombaerde, 2021).

Fostering international cooperation, however, is no easy feat. People differ in their willingness to comply with mask-wearing and social distancing mandates (Naso, 2020; Padidar et al., 2021; Yong & Choy, 2021). Countries also differ in their policy priorities of immunizing and protecting their country versus establishing international cooperation for managing the global outbreaks of COVID-19 (Kretchmer, 2021). We contend that a sense of global consciousness and identification is key to promoting a sense of togetherness in managing the ongoing public health crisis. In this research, we set out to examine how embracing a cosmopolitan orientation is associated with a set of COVID-19-related attitudes and perceptions that are deemed to have important downstream implications for better management and mitigation of the pandemic. The research was part of a two-wave multi-region investigation that provided the data for testing the temporal relationship between cosmopolitan orientation and COVID-19-related attitudes and perceptions over a three-month interval, with lagged effects offering valuable insights into how people's cosmopolitan orientation can be linked closely to various psychological reactions important to COVID-19 management.

The concept of cosmopolitan orientation

The notion of cosmopolitanism literally refers to people embracing the identity of being a "citizen of the world" (Brock, 2013). Cosmopolitanism has been widely discussed in contemporary social science discourses, but investigations were mainly carried out with a focus on theoretical or qualitative inquiries (Cleveland et al., 2011). Therefore, Leung and colleagues (2015) developed the Cosmopolitan Orientation Scale to contribute to and facilitate rigorous empirical investigations of this construct. This scale has been validated extensively to provide a sound psychometrical assessment of the three dimensions of cosmopolitan orientation (Leung et al., 2015).

Cosmopolitan orientation refers to the attitudinal and value orientations of individuals who regard themselves as part of the globalized world (Leung et al., 2015). Grounded on a thorough review of existing scholarly discussions and empirical studies on the concept, the three-factor model of cosmopolitan orientation was proposed. The model encompasses cultural openness, global prosociality, and respect for cultural diversity as the three core qualities of cosmopolitan individuals (Leung et al., 2015). First, people with a high cosmopolitan orientation have high openness and receptivity towards people, ideas, and experiences from other cultures (Hannerz, 1990). They actively look outward for learning opportunities and intellectual stimulation other cultures offer. Second, cosmopolitan individuals have a highly inclusive sense of community. They strongly believe that all people, locals and foreigners alike, are equally human and morally deserving. They seek to contribute to the diffusion of basic human rights and justice, as well as uphold the value of benevolence towards others regardless of their nationalities. Accordingly, they are also less likely to endorse ideologies that support social dominance, ethnocentrism, and inequality (Leung et al., 2015). Third, cosmopolitan individuals respect and welcome cultural differences, even finding delight in such differences (Ger, 1999). They serve as cultural brokers and gatekeepers to connect with different cultural communities and support the preservation of authentic forms of culture (Hannerz, 1990).

Notably, robust evidence demonstrated some important motivational and behavioral implications of being a cosmopolitan person. Across different country samples recruited in Australia, Singapore, and the U.S., findings revealed that cosmopolitan people tend to be more environmentally conscious (Leung et al., 2015), even after controlling for specific pro-environmental views. Research further supported that cosmopolitan people, through acquiring more knowledge about climate change issues and having a stronger sense of connectedness with nature, are more likely to lead an environmentally sustainable life (Ito et al., 2020). In another study, results showed that lower social dominance tendency (SDO) can strengthen the pro-environmental advantages of embracing a cosmopolitan orientation (Leung & Koh, 2019). Thus, the tendency to resist the human desire to overpower and exploit nature by less socially dominant individuals (i.e., low SDO), coupled with a higher cosmopolitan orientation, can strengthen one's motivation to engage in pro-environmental actions.

The etiology and functions of cosmopolitan orientation were further examined with a wider set of attitudinal and value variables in a two-wave study with large representative samples involving more than 8,700 adults from 19 countries (Liu et al., 2020). Metric invariance for the three cosmopolitan factors was established across these countries. In

general, people's cosmopolitan orientation predicted higher support for local civil society and more favorable attitudes and less prejudice towards immigrants. Some cosmopolitan orientation factors also positively predicted people's trust in the United Nations.

Cosmopolitan orientation and its relevance to the COVID-19 pandemic

In the present research, we argue that endorsing a cosmopolitan orientation is adaptive in the COVID-19 health crisis. It can help people recognize their status as part of an interconnected world for effectively dealing with the global pandemic. For example, for safety measures to be effective, people have to go beyond their self-interests and be willing to diligently comply with public safety measures for the greater collective good (Yong & Choy, 2021). Given cosmopolitan individuals' global consciousness and prosocial orientation, they can be better positioned to more accurately register the global nature of the health threats involved, recognize the importance of taking vaccines for developing herd immunity, and perceive a greater need for initiating collective efforts to contain the pandemic.

Another global challenge that was heavily discussed with COVID-19 is climate change. In fact, the nationwide lockdowns during the pandemic and the accompanying plunge in global economic activities have triggered some reduction in carbon emissions (Liu et al., 2020; Zeng & Bao, 2021). Further, the pandemic also demonstrated how vulnerable many countries in the world are to major disruptions in the global food supply chain (Aday & Aday, 2020). Some countries with limited resources and food-growing capacities (e.g., Singapore) had faced disruptions in food imports during the COVID-19 lockdown period. This suggests that it is pertinent for countries to look for alternative methods of producing or securing food sources (e.g., cultured meat, plant-based diet) beyond relying on existing food import options. The awareness and acceptance of alternative proteins, and hence the development of supporting technologies, can help promote a healthier and sustainable food source (Chong et al., 2022). In other words, the pandemic might play an important role in facilitating efforts and initiatives for addressing resource disparity and for mitigating and adapting to climate change. With the pandemic having the potential to turn global challenges such as resource inequality and climate change into opportunities for positive change, we contend that there is a higher likelihood that cosmopolitan people are more cognizant of this potential and more ready to embrace these opportunities.

In this light, we argue that the endorsement of a cosmopolitan orientation as an individual difference can help

people transcend self-interests and national parochialism; it can promote greater concerns for all humanity and for prioritizing collective (vs. personal) benefits. The sense of global consciousness exhibited by cosmopolitan individuals can help them perceive and react to the pandemic in an adaptive way that helps to mitigate the infectious spread of the disease. The current research thus sought to empirically examine the associations between cosmopolitan orientation and (a) people's perceptions of threats and opportunities presented by COVID-19 (e.g., threats to global safety and opportunities for positive change such as promoting egalitarianism and climate change mitigation), (b) their vaccine suspicion and willingness to take vaccines, and (c) their attitudes towards adhering to safety measures and supporting collective efforts to contain the pandemic. We expected cosmopolitan orientation to be associated with attitudes, perceptions, and intended behaviors that can facilitate better management and mitigation of the COVID-19 health crisis.

The present research: cosmopolitan orientation and COVID-19-related attitudes and perceptions

The current two-wave multi-region study aimed to test a set of hypotheses with six different samples from China, Hong Kong, Taiwan, Malaysia, Singapore, and the U.S. First, we predicted that a cosmopolitan orientation is positively associated with perceiving that COVID-19 poses as a threat to global safety (*Hypothesis 1*). Accordingly, with greater awareness of the impending threats, cosmopolitan individuals are more likely to recognize the importance of taking safety measures and encouraging collective efforts to work together towards the common goal of containing the pandemic. As such, we also predicted that a cosmopolitan orientation is positively associated with the degree to which people adhere to safety measures (*Hypothesis 2*), and the degree to which they believe that citizens in their society must work together to protect public safety (*Hypothesis 3*).

Second, we aimed to find out whether cosmopolitan individuals would tend to see opportunities for positive change out of the challenges posed by the pandemic. We predicted that a cosmopolitan orientation is positively associated with the likelihood of perceiving that COVID-19 can offer opportunities for positive change, such as encouraging greater egalitarianism in the economy (e.g., reducing resource disparity) and environmental friendliness (*Hypothesis 4*).

Third, the current work also examined whether cosmopolitan orientation would predict vaccine-related attitudes. The extraordinary speed in developing and approving vaccines has caused some people to show hesitancy and distrust towards the vaccines and their efficacy (Küçükali et

al., 2022). Some also expressed worry about the vaccines' potential side effects that may emerge in the future (Solís Arce et al., 2021). We argue that cosmopolitan people are more likely to recognize the severity of the pandemic and acknowledge the scientific evidence of the vaccines' effectiveness, thus reducing their suspicion or distrust towards the vaccines (e.g., Ashford et al., 2021). Thus, we predict that cosmopolitan orientation is positively associated with the willingness to be vaccinated (*Hypothesis 5*).

Finally, we sought to test the relationship between cosmopolitan orientation and peoples' support for collective containment efforts. Given their recognition of global interconnectedness and the imminent health threats, we suppose that cosmopolitan people are more inclined to support collective containment efforts which tighten social norms and prioritize collective interests before personal ones (e.g., supporting global institutions that uphold collective interests, see Liu et al., 2020; McFarland et al., 2019). Thus, we predict that cosmopolitan orientation is positively associated with support for collective containment efforts (*Hypothesis 6*). Finally, in the current research we also considered and measured the concept of cultural tightness as a control variable, which refers to the strength of social norms and the likelihood that deviance is punished in the society (Gelfand et al., 2011). Gelfand and colleagues (2021) have shown that nations with tighter cultures confer an evolutionary advantage of having less COVID-19 cases and higher survival rates in times of the pandemic through promoting norms for cooperation much faster in these societies. Therefore, we controlled for cultural tightness to examine if cosmopolitan orientation can predict support for collective containment efforts above and beyond people's endorsement of cultural tightness. These hypotheses were not preregistered.

Methods

Participants

A two-wave survey study was conducted in this research to recruit participants across six different regions (China, Hong Kong, Taiwan, Malaysia, Singapore, and the U.S.[1]). Wave 1 of the survey was administered by a data collection company from July 2 to 12, 2020 and recruited 6,138 participants. After three months, the company contacted all Wave 1 participants but only about 1 in 4 participants responded to the Wave 2 survey, resulting in a total of 1,449 participants completing both waves of the study. The two waves of survey included identical measures, with the exception of measures on vaccine suspicion, willingness to vaccinate, and attitudes towards supporting collective efforts to contain COVID-19 which were included in the Wave 2 survey only. The sample size was based on the grant budget that could be maximally allocated to recruit participants to this research. Notably, the two waves of the study took place during the time when there was a widespread outbreak of COVID-19 in different parts of the world and before the World Health Organization granted emergency use authorization of vaccines to allow Pfizer, Moderna, and other vaccines to be distributed for use among adults in December 2020. Participants were recruited with stratified sampling based on their gender, age, and socioeconomic status. The three-month interval between the two waves was the maximum time the international panel provider agreed to maintain a 50% sample retention rate given the data collection contract. To remove poor-quality data, we dropped 21 participants (1.4%) for "straight-lining" or giving identical responses to two or more survey pages in the first wave. We dropped an additional 167 participants (11.5%) for failing either of the two simple attention checks in the second wave. The remaining sample comprised 1,261 participants capturing a diverse adult population (M_{age} = 43.81, SD_{age} = 12.32, females = 50.4%; Table S1). The study materials, data, and analysis scripts used for this research can be accessed at https://osf.io/pqvut/?view_only=e2419d8c26534fc19e6f91433fdbfeed. The research was approved by the ethics board of the grant principal investigator's institution and upholds the ethical standards laid down in the 1964 Declaration of Helsinki and subsequent amendments.

Measures

The measures reported in this paper were administered alongside a larger battery of measures as part of a multi-region research collaboration examining various research questions. Measures on cosmopolitan orientation, cultural tightness, and attitudes towards COVID-19 as threats and opportunities were administered in both waves. Measures on vaccine suspicion and willingness to vaccinate, as well as attitudes towards supporting collective efforts to contain COVID-19 were administered in Wave 2 only. Unless otherwise specified, all scales captured participants' agreement to each item on a 7-point Likert scale, where a higher value indicates stronger agreement. The scales used in the current study as well as all other scales measured for other research purposes are available at https://osf.io/pqvut/?view_only=e2419d8c26534fc19e6f91433fdbfeed.

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[1] The original survey was designed to examine the development of global consciousness in Chinese-speaking societies; Singapore and Malaysia were included because Chinese persons are an important demographic in these multicultural societies, and the U.S. was included for comparison purposes.

Cosmopolitan orientation

The cosmopolitan orientation scale consists of 15 validated items that measure three dimensions of cosmopolitan orientation (Leung et al., 2015; Leung & Koh, 2019). The *cultural openness* dimension reflects receptiveness to immerse in and learn from other cultures (5 items; e.g., "I enjoy learning more about different cultures in the world"). The *global prosociality* dimension denotes a sense of collective moral obligation to universally respect and promote basic human rights (5 items; e.g., "I would serve the community by helping human beings"). The *respect for cultural diversity* dimension concerns high tolerance of and appreciation for cultural differences (5 items; e.g., "I embrace cultural diversity"). Per our earlier research, the three dimensions are theorized to form a global factor of cosmopolitan orientation. Confirmatory factor analyses (CFA; see results) supported that all three dimensions load on a higher-order factor (λs > 0.70), and the latent factors are highly related (rs = 0.56 to 0.68). Therefore, we aggregated the three factors and based the analyses on the global factor of cosmopolitan orientation (α_{t1} = 0.91; α_{t2} = 0.91).

Cultural tightness

The six-item measure of cultural tightness developed by Gelfand and colleagues (2011) was administered in both waves (α_{t1} = 0.76; α_{t2} = 0.77). Sample items include "In this country, if someone acts in an inappropriate way, others will strongly disapprove" and "People in this country almost always comply with social norms", which were rated on a 6-point Likert scale (1 = *strongly disagree* to 6 = *strongly agree*).

Attitudes towards COVID-19 as threats and opportunities

To examine how participants perceived COVID-19 as threats and opportunities, five items were developed. Three items are related to perceived threats and threat management: "COVID-19 is a serious threat to public safety around the world" (*perceived threat*), "I have taken preventive measures as a protection against COVID-19 (e.g., wearing a mask, staying at home as much as possible, washing hands regularly)" (*preventive measures taken*), and "In response to the threat of COVID-19, people in my country/society must all work together to protect public safety" (*collaboration against threat*). Two items are related to potential opportunities for positive change offered by the COVID-19 pandemic (*opportunities for positive change*): "The world should grasp the opportunity COVID-19 has provided to become more environmentally friendly (e.g., develop a green economy)" and "The world should grasp the opportunity COVID-19 has provided to become more egalitarian in its economy (e.g., reducing the gap between rich and poor"). CFA was conducted on this two-item measure (see Results section).

Vaccine suspicion

Five items from the Vaccine Conspiracy Beliefs Scale (Shapiro et al., 2016) were used to assess participants' general suspicion of vaccines. The original scale has seven items, but due to survey length constraint two items were not included in this study (i.e., "Vaccine efficacy data are often fabricated" and "People are deceived about vaccine safety") as they are highly similar to other two items ("Vaccine safety data are often fabricated" and "People are deceived about vaccine efficacy"). The other three items are "Immunizing children is harmful and this fact is covered up", "Pharmaceutical companies cover up the dangers of vaccines", and "The government is trying to cover up the link between vaccines and autism" (α = 0.92).

Willingness to vaccinate

Participants' willingness to be vaccinated against COVID-19 was measured with a single self-developed item ("If a COVID-19 vaccine is discovered, I would be willing to be vaccinated").

Supporting collective efforts to contain COVID-19

Six items were developed to capture participants' support for having collective containment efforts in terms of promoting stronger social norms and upholding collective interests in response to the pandemic. Participants indicated their agreement with six statements that start with "In response to the threat of COVID-19…": (a) there should be more social norms that people are supposed to abide by in this country, (b) if someone acts in an inappropriate way, others should more strongly disapprove, (c) people in this country should comply more with social norms, (d) people in this country should sacrifice self-interests to achieve collective interests, (e) people in this country should privilege collective interests over self-interests; and (f) people in this country should yield to collective interests (α = 0.91).

Demographics

Finally, participants completed some demographic items about their gender, marital status, and subjective socioeconomic status (measured by the MacArthur scale of subjective socioeconomic status; Adler et al., 2000).

Results

Longitudinal and cross-cultural measurement invariance analysis

Recently, scholars have highlighted the importance of establishing measurement invariance in longitudinal studies (Liu et al., 2017; Xu et al., 2020). Importantly, parameter estimates can be biased if a sizable number of items are non-invariant over time and across groups. As such, we tested and established longitudinal measurement and cross-cultural invariance of our key predictor, cosmopolitan orientation, before proceeding with the main analyses. We adopted the model specifications outlined by Rudnev and colleagues (2018) to analyze measurement invariance of second order factors. Succinctly, the cosmopolitan orientation scale exhibits full metric and scalar longitudinal invariance, and full metric cross-cultural invariance with partial scalar invariance for four of the six samples (for detailed analyses, see Supplementary Appendices A-B & Tables S2-3). Therefore, our data was suitable for both longitudinal and cross-cultural analyses according to the criteria specified by Steenkamp and Baumgartner (1998).

Findings from the latent cross-lagged panel model: cosmopolitan orientation increases perceived threats and opportunities of COVID-19 over time

We employed the latent cross-lagged panel model (L-CLPM) to test the lagged effects of cosmopolitan orientation on participants' attitudes towards COVID-19 as threats and opportunities that were measured in both waves. This allows an inference of potential causality if the lagged effects between the two variables are only observed in one direction. We opted to employ the latent variant rather than traditional CLPM to statistically partial out measurement errors where possible (Humphreys, 1991; Judd et al., 1986). The descriptive statistics for these variables are shown in Table 1.

Taking a two-step approach, we first established the full scalar longitudinal invariance of the measurement model, RMSEA $= 0.041$, CFI $= 0.96$, $\chi^2(523) = 1637.58$, which was not significantly poorer than the unconstrained model $\chi^2(2) = 4.51$, $p = .105$.

Next, we tested the full L-CLPM as illustrated in Fig. 1. The model showed good fit, RMSEA $= 0.052$, CFI $= 0.93$, $\chi^2(690) = 3011.32$. Importantly, the results supported our hypothesized lagged positive effects of cosmopolitan orientation on the four variables about COVID-19 related threats and opportunities. We then further refined the model by dropping non-significant paths one at a time until only significant cross-lagged paths remained. The final model showed good fit, RMSEA $= 0.052$, CFI $= 0.93$, $\chi^2(693) = 3014.25$

Table 1 Descriptive statistics and zero-order correlations of the variables in the L-CPLM

| #	Variable	M	SD	1	2	3	4	5	6	7	8	9
Wave 1 Variables												
1	Cosmopolitanism Orientation	4.62	0.73									
2	Perceived Threat	6.49	0.84	0.21***								
3	Preventive Measures Taken	6.33	0.88	0.26***	0.51***							
4	Cooperation against Threat	6.42	0.81	0.26***	0.55***	0.57***						
5	Opportunities for Positive Change	5.46	1.24	0.42***	0.33***	0.30***	0.34***					
Wave 2 Variables												
6	Cosmopolitanism Orientation	4.67	0.70	0.73***	0.17***	0.22***	0.19***	0.39***				
7	Perceived Threat	6.41	0.88	0.20***	0.58***	0.32***	0.41***	0.26***	0.20***			
8	Preventive Measures Taken	6.30	0.84	0.24***	0.37***	0.49***	0.41***	0.21***	0.23***	0.51***		
9	Cooperation against Threat	6.33	0.84	0.27***	0.43***	0.41***	0.52***	0.31***	0.27***	0.55***	0.57***	
10	Opportunities for Positive Change	5.44	1.25	0.38***	0.26***	0.19***	0.27***	0.66***	0.38***	0.30***	0.29***	0.37***

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$.
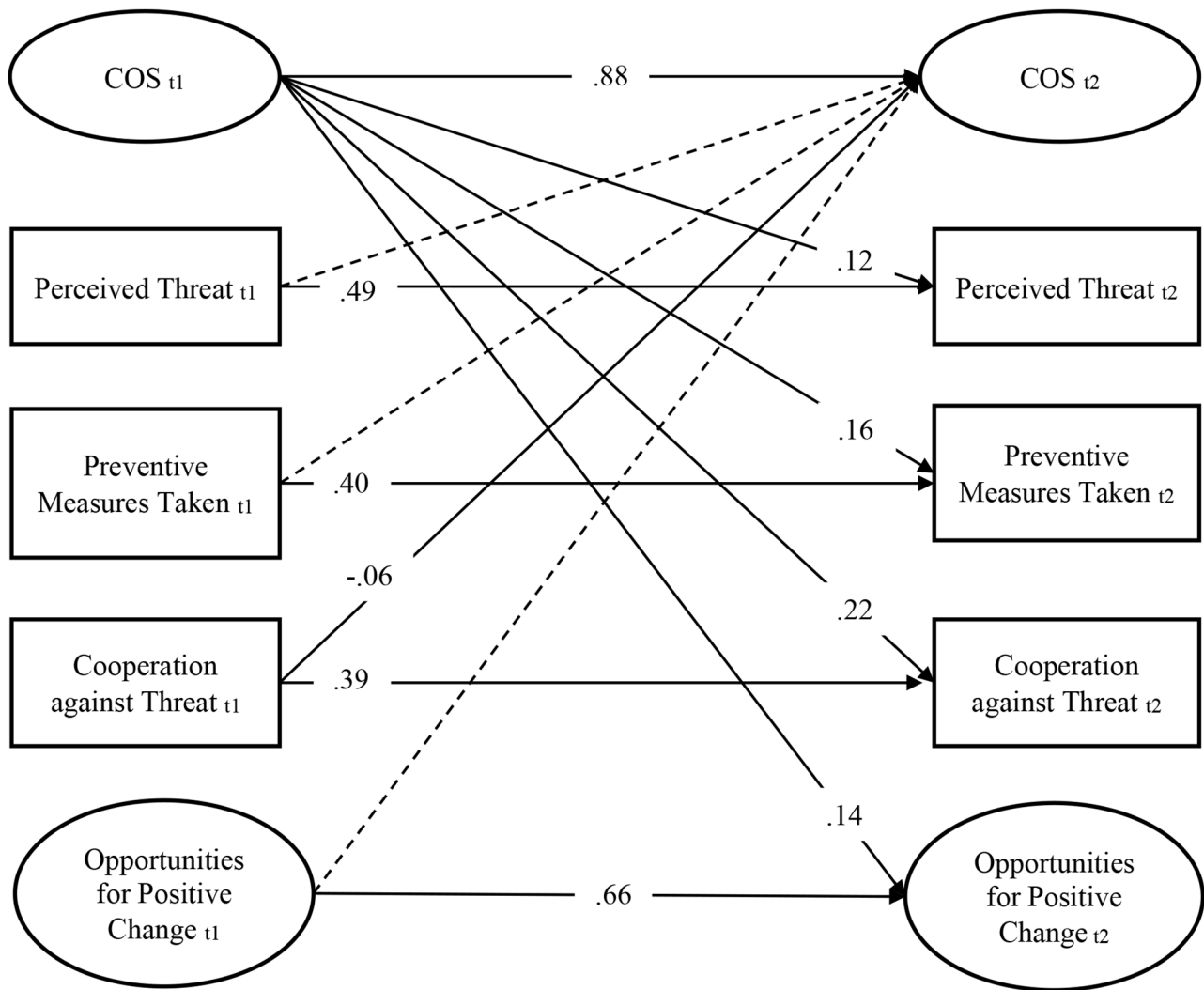
Fig. 1 Initial full model of L-CLPM
Notes. Solid paths represent significant relationships at $p < .05$; dotted paths were specified in the model but exhibit no significant relation- ship. Parameter estimates are standardized. See Table S4 for correla- tions between variables within each wave.

(see Fig. 2). Overall, results showed that participants with a higher cosmopolitan orientation were more likely to per- ceive over time a greater threat posed by COVID-19. They were also more likely to have taken safety measures, to uphold the belief that people in the country should collabo- rate to protect themselves against the pandemic, and to see opportunities for positive change brought about by COVID- 19. Opportunities identified included promoting environ- mental sustainability and egalitarianism. The correlations between variables in each wave are tabulated in Table S4.

As an exploration, we also tested whether the lagged effects observed in the L-CLPM would be generalizable across regions by including regions as a moderator to each of the lagged effects. We found that the L-CLPM models would not converge after including moderator terms. There- fore, we examined using multiple linear regression whether

region would moderate the relationship between cosmo- politan orientation at Wave 1 and each outcome variable at Wave 2 (i.e., lagged effects), while controlling for the out- come variables at Wave 1. These models therefore included regions as a moderator while estimating the lagged paths similar to the L-CLPM.

We found that the lagged effects of cosmopolitan ori- entation were not moderated by regions for perceived threat ($\Delta R^2 = 0.003$, $p = .36$), preventive measures taken ($\Delta R^2 = 0.001$, $p = .86$), and cooperation against threat ($\Delta R^2 = 0.001$, $p = .91$). This suggested that the lagged effects of cosmopolitan orientation on these outcome measures were generalizable across the six regions in our sample.

However, there was a significant moderation of regions on the lagged effect of cosmopolitan orientation on per- ceived opportunities for positive change ($\Delta R^2 = 0.006$,
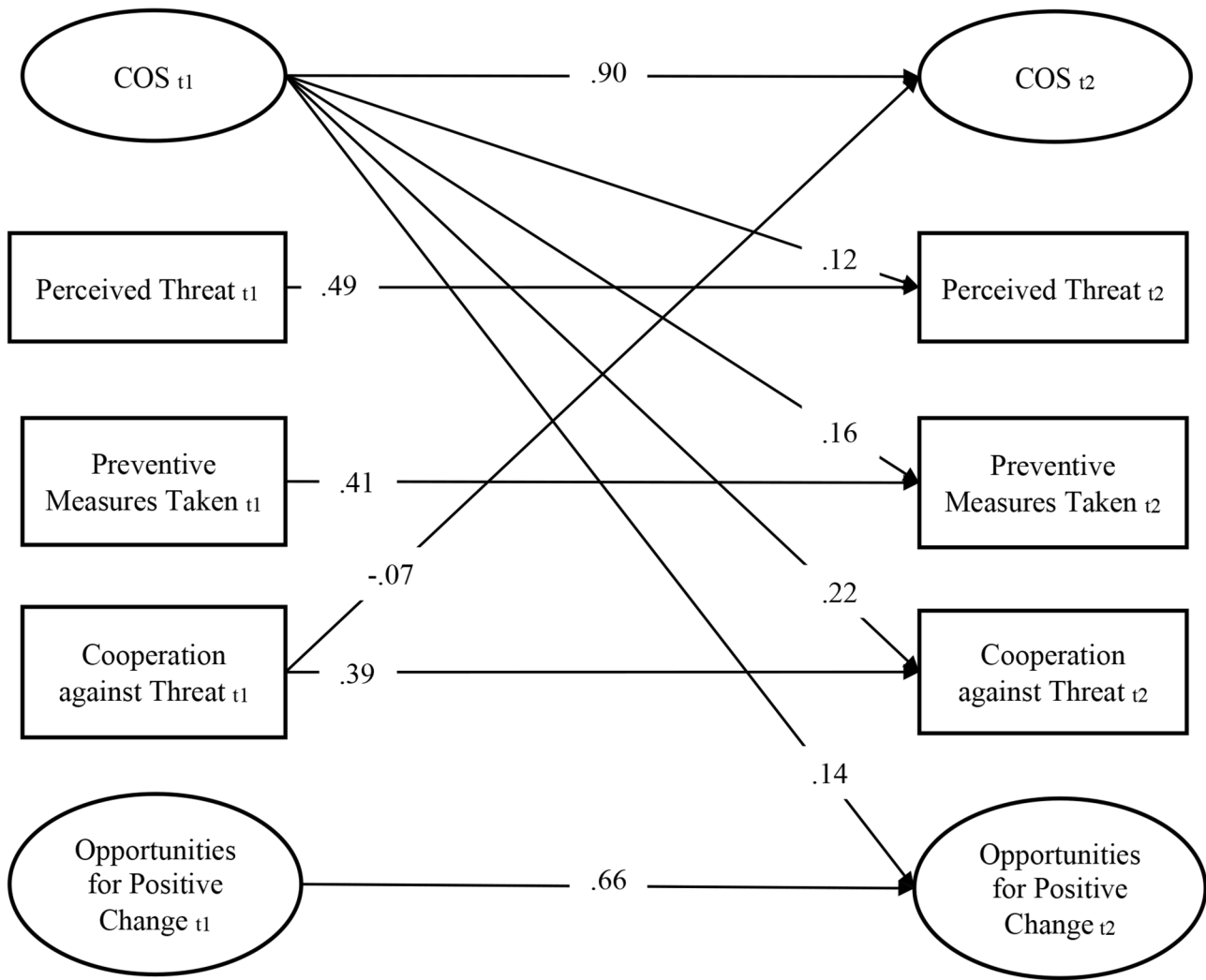
Fig. 2 Final model of L-CLPM
Notes. Solid paths represent significant relationships at $p < .05$. Param- eter estimates are standardized. See Table S4 for correlations between variables within each wave.

$F(5,1248)$, $p = .016$). The simple slopes revealed that the lagged effect of cosmopolitan orientation on perceived opportunities for positive change was only significant in the United States ($B = 0.43$, $SE = 0.08$, $p < .001$), but not in the other five regions ($ps > 0.10$).

Cosmopolitan orientation fosters willingness to be vaccinated and reduces vaccine suspicion

Next, we used hierarchical multiple linear regressions to analyze the relationship between cosmopolitan orientation and vaccine-related attitudes that were only measured in Wave 2 (see Table 2 for descriptive statistics). Specifically, we employed a series of multiple linear regressions to test whether cosmopolitan orientation predicted the willing- ness to take COVID-19 vaccines and buffered against the

general suspicion of vaccination. All models are tabulated in Table 3.

In Model 1, the willingness to vaccinate was regressed on four significant demographic covariates, including gender, subjective SES, marital status (currently married or not), and regions (dummy-coded). The covariates explained 9% of the variance, $F(8, 1250) = 15.94$. The variation in willing- ness to vaccinate across regions can be visualized in Fig. 3. In Model 2, vaccine suspicion was included which negatively predicts the willingness to vaccinate ($B = -0.48$, $SE = 0.03$, $p < .001$). This variable explained the most variance in the willingness to vaccinate ($\Delta R^2 = 0.13$, $\Delta F(1,1249) = 209.84$).

Model 3 confirmed our hypothesis that a cosmopoli- tan orientation fosters willingness to vaccinate ($B = 0.31$, $SE = 0.06$, $p < .001$, $\Delta R^2 = 0.02$). Importantly, Model 4 fur- ther showed that participants' change of cosmopolitan ori- entation between Waves 1 and 2 had incremental ability to

#	Variable	M	SD	1	2	3	4	5	6	7	8	9
Wave 1 Variables												
1	Cosmopolitanism Orientation	4.62	0.73									
2	Cultural Tightness	4.46	0.71	0.31***								
3	Gender (Female)	0.50	0.50	0.005	−0.06*							
4	Subjective SES	5.30	1.65	0.21***	0.18***	−0.06*						
5	Currently Married	0.56	0.50	−0.03	0.08**	−0.03	0.15***					
Wave 2 Variables												
6	Cosmopolitanism Orientation	4.67	0.70	0.73***	0.30***	−0.01	0.16***	0.04				
7	Cultural Tightness	4.49	0.71	0.29***	0.62***	−0.05	0.16***	0.12***	0.37***			
8	Support for Collective Containment Efforts	5.50	1.08	0.29***	0.32***	−0.05	0.14**	0.12***	0.31***	0.41***		
9	Suspicion of Vaccines	3.38	1.28	0.002	−0.14***	−0.004	−0.07*	−0.11***	−0.02	−0.18***	−0.26***	
10	Vaccine Willingness	4.76	1.56	0.20***	0.22***	−0.13***	0.15***	0.12***	0.21***	0.25***	0.39***	−0.38***

Notes. *$p < .05$, **$p < .01$, ***$p < .001$. Gender was coded as 1 = Female, 0 = Male.

predict their willingness to vaccinate ($B = 0.22$, $SE = 0.08$, $p < .001$, $\Delta R^2 = 0.004$). This hints at the possibility that changing people's cosmopolitan orientation may lead to a change in their willingness to take vaccines.

As an exploratory test, Model 5 revealed that cosmopolitan orientation moderated the link between vaccine suspicion and willingness to vaccinate ($\Delta R^2 = 0.003$, $\Delta F(1,1246) = 5.63$). Specifically, the negative link between vaccine suspicion and willingness to vaccinate was stronger when participants' cosmopolitan orientation was low (1 SD below mean; $B_{simple} = -0.55$, $SE = 0.04$, $p < .001$) and became attenuated when cosmopolitan orientation was high (1 SD above mean; $B_{simple} = -0.42$, $SE = 0.04$, $p < .001$; Fig. S1).

We further explored whether the link between cosmopolitan orientation and the willingness to vaccinate would be generalizable across regions. Testing for the interaction between regions and cosmopolitan orientation in addition to the variables in Model 5, we found that regions did not interact with cosmopolitan orientation in predicting the willingness to vaccinate ($\Delta R^2 = 0.003$, $\Delta F(5,1236) = 0.89$, $p = .488$), nor did regions interact with the change of cosmopolitan orientation between Waves 1 and 2 ($\Delta R^2 = 0.006$, $\Delta F(5,1236) = 2.08$, $p = .065$). This suggests that the increased willingness to vaccinate among those with higher cosmopolitan orientation was generalizable across the six regions in our sample.

Cosmopolitan orientation promotes a stronger support for collective containment efforts

We employed a series of multiple linear regressions to examine if cosmopolitan orientation promotes support for collective containment efforts by imposing stronger social norms and prioritizing collective interests over individual interests (see Table 4). Importantly, we examined if it does so incrementally over the culture's tightness (vs. looseness), and whether the change in cosmopolitan orientation between the two waves also incrementally predicts support for collective containment efforts.

In Model 1, we identified two demographic covariates, regions (dummy-coded) and marital status (being currently married), which both positively related to support for collective containment efforts. The covariates explained 11% of the variance, $F(6, 1254) = 27.56$. The variation in support for collective containment efforts can be visualized in Fig. 4. In Model 2, we included cultural tightness measured in Wave 1 which, as expected, predicted participants' support for collective efforts to contain COVID-19 ($B = 0.37$, $SE = 0.04$, $p < .001$, $\Delta R^2 = 0.05$, $\Delta F(1,1253) = 81.23$).

Importantly, Model 3 supported our prediction that a cosmopolitan orientation incrementally boosted

Table 3 Multiple linear regression models predicting the willingness to vaccinate

Model	Outcome: Willingness to Vaccinate					Std. B
	1	2	3	4	5	
Constant	4.03^{***}	3.88^{***}	4.09^{***}	4.10^{***}	4.10^{***}	
	(0.19)	(0.17)	(0.18)	(0.18)	(0.18)	
Female	-0.33^{***}	-0.31^{***}	-0.33^{***}	-0.33^{***}	-0.33^{***}	-0.10^{***}
	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)	
Subjective SES	0.09^{***}	0.08^{**}	0.05^{*}	0.05^{*}	0.05^{*}	0.05^{*}
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	
Married	0.25^{**}	0.21^{*}	0.23^{**}	0.21^{**}	0.21^{*}	0.07^{*}
	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)	
China (vs. the U.S.)	0.77^{***}	0.63^{***}	0.53^{***}	0.52^{***}	0.56^{***}	0.13^{***}
	(0.16)	(0.15)	(0.15)	(0.15)	(0.15)	
Hong Kong (vs. the U.S.)	-0.17	0.23	0.21	0.22	0.24	0.06
	(0.14)	(0.14)	(0.13)	(0.13)	(0.13)	
Malaysia (vs. the U.S.)	0.65^{***}	1.08^{***}	0.88^{***}	0.87^{***}	0.88^{***}	0.18^{***}
	(0.17)	(0.16)	(0.16)	(0.16)	(0.16)	
Singapore (vs. the U.S.)	0.47^{**}	0.83^{***}	0.67^{***}	0.66^{***}	0.67^{***}	0.15^{***}
	(0.16)	(0.15)	(0.15)	(0.15)	(0.15)	
Taiwan (vs. the U.S.)	0.18	0.61^{***}	0.53^{***}	0.52^{***}	0.54^{***}	0.14^{***}
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	
Vaccine Suspicion $_{t2}$		-0.48^{***}	-0.48^{***}	-0.47^{***}	-0.48^{***}	-0.39^{***}
		(0.03)	(0.03)	(0.03)	(0.03)	
Cosmopolitan Orientation (CO) $_{t1}$			0.31^{***}	0.38^{***}	0.39^{***}	0.18^{***}
			(0.06)	(0.06)	(0.06)	
Change in CO $_{t2-t1}$				0.22^{**}	0.23^{**}	0.08^{**}
				(0.08)	(0.08)	
CO $_{t1}$ · Vaccine Suspicion $_{t2}$					0.09^{*}	0.06^{*}
					(0.04)	
R^2	0.09	0.22	0.24	0.25	0.25	
F	15.94	39.85	39.72	36.94	34.45	
ΔR^2	0.09	0.13	0.02	0.004	0.003	
ΔF	15.94	209.84	30.15	7.17	5.63	

Notes. $* p < .05$, $** p < .01$, $*** p < .001$. Vaccine suspicion, CO, and change in CO between waves were mean-centered. Beta coefficients are non-standardized except in the right-most column to facilitate comparison. Standard errors are presented in parentheses.

Fig. 3 Visualization of the willingness to vaccinate across region *Notes.* Willingness to vaccinate significantly differs across regions, $F(5, 1250) = 12.69$, $\eta_p^2 = 0.048$, after controlling for gender, marital status, and SES. Each region's mean is represented with numeric labels, and their 95% confidence intervals with error bars. Non-overlapping error bars represent significant pairwise contrasts after Bonferroni correction. Dashed horizontal lines are aids for comparisons.
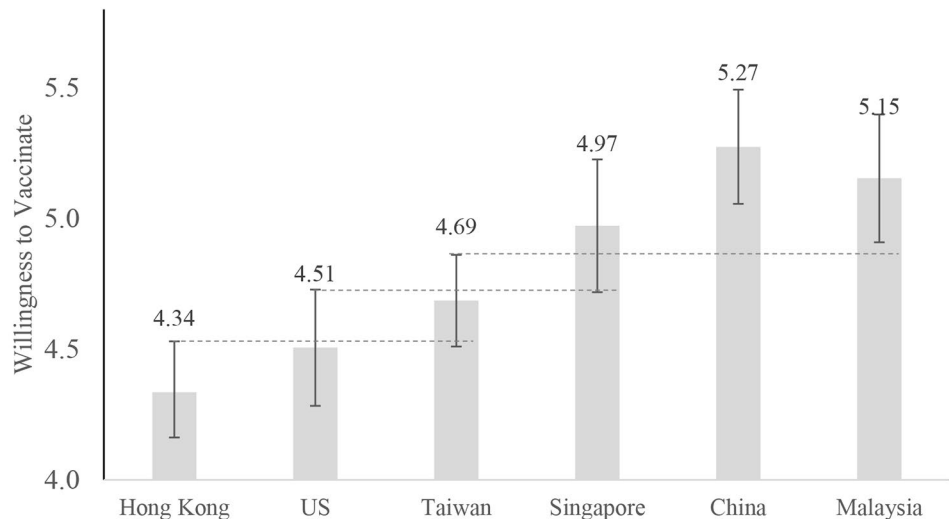
Table 4 Multiple linear regression predicting support for collective efforts to contain Covid-19

| Model | Outcome: Support for Collective Containment Efforts | | | | |
	1	2	3	4	Std B.
(Constant)	5.18***	3.62***	2.77***	2.00***	
	(0.08)	(0.19)	(0.23)	(0.21)	
Married	0.20**	0.16**	0.18**	0.13*	0.06
	(0.06)	(0.06)	(0.06)	(0.06)	
China (vs. the U.S.)	0.56***	0.39***	0.34**	0.28**	0.09
	(0.11)	(0.11)	(0.10)	(0.10)	
Hong Kong (vs. the U.S.)	-0.26**	-0.22*	-0.24*	-0.17	−0.07
	(0.10)	(0.09)	(0.09)	(0.09)	
Malaysia (vs. the U.S.)	0.77***	0.62***	0.48***	0.48***	0.14
	(0.11)	(0.11)	(0.11)	(0.11)	
Singapore (vs. the U.S.)	0.45***	0.31**	0.20	0.20*	0.07
	(0.11)	(0.11)	(0.11)	(0.10)	
Taiwan (vs. the U.S.)	0.13	0.08	0.02	0.02	0.01
	(0.10)	(0.10)	(0.09)	(0.09)	
Cultural Tightness $_{t1}$		0.37***	0.30***	0.47***	0.31
		(0.04)	(0.04)	(0.05)	
Cosmopolitan Orientation (CO) $_{t1}$			0.26***	0.26***	0.18
			(0.04)	(0.04)	
Change in Cultural Tightness $_{t2-t1}$				0.40***	0.23
				(0.05)	
Change in CO $_{t2-t1}$				0.13*	0.06
				(0.06)	
R^2	0.12	0.17	0.2	0.25	
F	27.56	36.74	38.15	40.80	
ΔR^2	0.12	0.05	0.03	0.05	
ΔF	27.56	81.23	40.01	41.53	

Notes. * $p<.05$, ** $p<.01$, *** $p<.001$. Beta coefficients are non-standardized except in the right-most column to facilitate comparison. Standard errors are presented in parentheses.

Fig. 4 Visualization of the support for collective containment efforts across regions
Notes. Support for collective containment efforts differs across regions, $F(5, 1254)=29.31$, $\eta_p^2=0.105$, after controlling for marital status. Each region's mean is represented with numeric labels, and their 95% confidence intervals with error bars. Non-overlapping error bars represent significant pairwise contrasts after Bonferroni correction. Dashed horizontal lines are aids for comparisons.
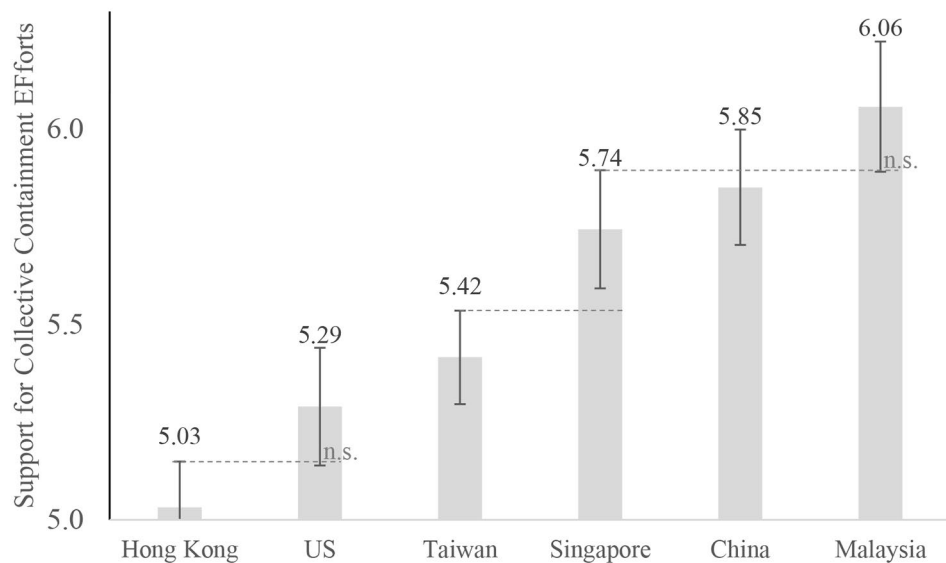
participants' support for collective containment efforts ($B=0.26$, $SE=0.04$, $B_{std} = 0.17$, $p<.001$, $\Delta R^2=0.02$, $\Delta F(1,1252)=40.01$), independently of cultural tightness ($B=0.30$, $SE=0.04$, $B_{std}=0.20$, $p<.001$). We also note that their standardized betas are of relatively similar sizes.

In Model 4, we included the change in perceived cultural tightness and cosmopolitan orientation between Waves 1 and 2. Both the change in perceived cultural tightness ($B=0.40$, $SE=0.05$, $p<.001$) and change in cosmopolitan orientation ($B=0.13$, $SE=0.06$, $p=.020$) incrementally predicted

participants' support for collective containment efforts ($\Delta R^2 = 0.05$, $\Delta F(1,1250) = 41.53$). It is reasonable to posit that both perceived cultural tightness and cosmopolitan orientation can increase people's own efforts to participate in actions that uphold collective interests, and that promoting the cosmopolitan orientation of a group of individuals can potentially elicit such positive behaviors collectively.

Finally, we again explored the extent that these findings generalize across regions. We tested whether cosmopolitan orientation and its change between Wave 1 and Wave 2 is moderated by regions when predicting support for collective containment efforts, in addition to the variables presented in Model 4. We found that regions did not interact with cosmopolitan orientation in predicting support for collective containment efforts ($\Delta R^2 = 0.006$, $\Delta F(5,1240) = 2.01$, $p = .075$), nor did regions interact with the change of cosmopolitan orientation between Waves 1 and 2 ($\Delta R^2 = 0.006$, $\Delta F(5,1240) = 2.02$, $p = .072$). This suggests that the increased support for collective containment efforts among those with higher cosmopolitan orientation was generalizable across the six regions in our sample.

Discussion

Through a two-wave multi-region study, the current work revealed novel insights regarding the role of a cosmopolitan orientation in a global pandemic. Individuals high on cosmopolitan orientation were more likely to show attitudes and behaviors that facilitated the management of the COVID-19 health crisis. Specifically, a cosmopolitan orientation predicted greater recognition of COVID-19 as a threat (*Hypothesis 1*), adherence to safety measures (*Hypothesis 2*), support for interpersonal cooperation (*Hypothesis 3*), and recognition of COVID-19 offering opportunities to make the world better. Amidst the pandemic situation, reported opportunities included being more egalitarian in the economy and environmentally friendly (*Hypothesis 4*). Additionally, higher cosmopolitan orientation was associated with a greater willingness to be vaccinated (*Hypothesis 5*) and a greater support for collective containment efforts (*Hypothesis 6*), which are attitudes that can facilitate the containment of COVID-19. In addition, results revealed that cosmopolitan orientation mitigated the negative effect of people's vaccine hesitancy on their willingness to be vaccinated. This suggests that individuals who are more cosmopolitan are still more willing to take the vaccine even in the face of vaccine suspicion than their less cosmopolitan counterparts. As a world citizen, cosmopolitan people may feel a greater sense of responsibility to be vaccinated so as to contribute their part in preventing the spread of the virus despite their vaccine hesitancy.

Theoretical contributions

The current findings lent support for the pancultural nature of the construct of cosmopolitan orientation. Analyses revealed that the findings about cosmopolitan orientation remained relatively stable across different regions, spanning from more individualistic societies like the United States to more collectivistic societies in Asia. The cosmopolitan identification as part of a globalized world is a personological variable that can transcend cultures—thus, the different regions examined in the current study showed a very similar role of cosmopolitan orientation in various COVID-19-related attitudes and behaviors.

Importantly, the data were collected at a time when our understanding of the virus—such as the effectiveness of safety measures and the perceived threat of COVID-19—was still developing (mid to late 2020; Seale et al., 2020). Amid times when people's attitudes and understanding of the pandemic were largely fluid, it further speaks to the current work's important contributions of capturing these attitudes and demonstrating how individuals' relatively stable cosmopolitan orientation could predict their change in views in such an emerging situation.

The numerous measures used to capture individuals' attitudes and behaviors toward the COVID-19 pandemic provided significant rigor to the present research. Results across a wide range of COVID-19 reactions revealed that a cosmopolitan orientation can facilitate various attitudes and intended behaviors which are adaptive in the COVID-19 crisis ranging from recognizing the pandemic as a threat, to supporting policies that promote containment efforts, and to showing high vaccination willingness. Thus, the current findings suggest the value of promoting people's cosmopolitan orientation in contributing to the effective mitigation of the pandemic. Furthermore, it is reasonable to argue that while the cosmopolitan orientation is vital for adapting to crises, it is a quality that takes time to nurture and develop. This calls for nations and their leaders to cultivate a cosmopolitan orientation, including other values conducive to multicultural openness and self-transcendence, in the nation's policies and cultural practices. Research suggested that multicultural experiences that cosmopolitan people commonly encounter are linked to better psychological adjustment, resilience, and creative coping (Leung et al., 2008; Maddux et al., 2021). Fostering a sense of cosmopolitanism in society can prepare a nation and its people well to unite in solidarity when adversity strikes.

Our research team has recently found that individuals' global consciousness facilitates behaviors beneficial for the greater good (Liu et al., 2022). However, in terms of economic exchange, the greater cooperativeness of these individuals may be taken advantage of by those who are

less publicly minded. In contrast to situations of economic exchange, however, the more cosmopolitan and cooperative individual actually reaps more benefits than the less cooperative defector in a pandemic situation because they are less likely to personally contract the virus and suffer adverse health consequences. When misinformation is rampant (Shahi et al., 2021) and perceptions of COVID-19 are rapidly changing (Seale et al., 2020), it is increasingly important to encourage individuals to recognize their role as part of the globalized world. As shown in the current work, those who embrace their identity as a global citizen are more likely to engage in behaviors that facilitate a more adaptive management of the COVID-19 crisis in these trying times. Importantly, these individuals are also able to recognize the opportunity to make the world a better place economically and environmentally, allowing them to seize an opportunity to change society for the better.

Contributions towards measurement issues of cosmopolitan orientation

An important contribution of the current research is that it gathers strong psychometric evidence to measure cosmopolitan orientation. The cosmopolitan orientation scale evidently possesses full metric and scalar longitudinal variance for both the scale's first- and second-order factors, lending validity to its use in a multi-wave setting. Therefore, the cosmopolitan orientation scale is deemed useful for cross-cultural comparison research that includes both Western and non-Western cultures. Furthermore, the high test-retest correlation supported the stability of individuals' cosmopolitan orientation, aligning with the theoretical view that cosmopolitan orientation is a trait-like attribute (Leung et al., 2015).

Although our results remained robust even after controlling for a variety of demographic covariates and sampling from six regions, this non-experimental research may still be exposed to unmeasured confounds, which can limit the inference of causality. Given the focus of the research funding that supported this investigation, the study included more Asian societies and mainly one Western country (the U.S.). Future work may consider testing the observed relationships beyond these regions. Examining an even broader range of countries and more ethnicities can further strengthen support for the pancultural nature of the cosmopolitan orientation. In addition, it would be worth conducting an experimental study in a longitudinal manner to test the effectiveness of training people to be more cosmopolitan and the longer-term impact of such a program.

To conclude, by fostering and tapping on people's cosmopolitan orientation, there is a great promise for encouraging them to play their part in the COVID-19 pandemic by prioritizing the greater good of the whole of humanity. Cosmopolitan people are also more likely to recognize the potential provided by the pandemic to make the society more egalitarian and more environmentally sustainable, thereby turning a challenge into an opportunity for achieving important collective benefits.

Declarations

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

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