

Analysis of the Relationship Between Vertical Collectivism, Health Behaviors, and Covid-19 Vaccine Intentions: Based on the “Process-Person-Situation-Time” Model

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Abstract: The purpose of this study was to examine the relationship among vertical collectivism, health behaviors, and vaccine intentions; and the mediating role of COVID-19 attitudes. A total of 2244 participations was collected in this study. R software environment was used to conduct the path analysis in this study. The results showed that (1) there was a significant positive relationship between vertical collectivism, individuals' health behaviors and COVID-19 vaccine intentions; (2) COVID-19 attitudes mediated the relationship between vertical collectivism, health behaviors, and COVID-19 vaccine intentions. The results of this study have theoretical and practical implications for the prevention and vaccination of neo-coronavirus, and this study also provides empirical evidence to use R software environment and new methodological approaches in public health area.

1 INTRODUCTION

COVID-19 was officially classified as a global pandemic in March 2020 (WHO 2020 Coronavirus disease (COVID-19) Situation Report). To reduce the spread of the virus and reduce the likelihood of illness, most countries recommend or require individuals to adopt or partially adopt healthy behaviours (e.g., social distance and wearing masks) to curb the spread of the virus, and to reduce the strain on national public health systems and the number of deaths (National Health Commission of the PRC Prevention and control of COVID19). The governments and WHO provided guidelines for healthy behaviours such as frequent hand washing, avoiding facial contact, disinfecting touched objects, maintaining social distance, and wearing masks; In addition, vaccination is effective in reducing group infection rates and prevent serious illness after infection (WHO 2020 Coronavirus disease (COVID-19) Situation Report; National Health Commission of the PRC Prevention and control of COVID19). Despite global calls from governments and mass media, there are still significant differences in

people's health behaviours in different regions (Anderson, 2020). Therefore, it becomes necessary to understand the mechanisms by which individuals' health behaviours occur and develop during a new crown epidemic.

1.1 Vertical Collectivism, Health Behaviors, and Covid-19 Vaccine Intention

Although there have been many studies demonstrating the effectiveness of health behaviors and the covid-19 vaccine (Lewnard, 2020; Kim, 2021), not all individuals adopt them. One reason is that these behaviors require individuals to make some sacrifices for the health of others and the community. For example, maintaining social distance may require separation from family and friends; wearing a mask may cause discomfort; and vaccinations may have side effects. These practices could be regarded as social dilemma in which individuals' short-term interests conflict with collective long-term interests (Bogaert, 2008; Van Lange, 2013). Henceforth, researchers have attempted to understand individuals'

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health behaviors and vaccination intentions during COVID-19 from a collectivist-individualist perspective (Huang, 2020).

Vertical collectivism is the recognition of hierarchical relationships among members of a society, emphasizing solidarity within the group, advocating individual service, dedication, and even sacrifice for the collective (Singelis, 1995). Biddlestone, Green, and Douglas have found that, vertical collectivism positively predicted the level of individuals' intentions to maintain social distance during COVID-19 and high vertical collectivism individuals also have a higher vaccine hesitancy (Biddlestone, 2020). Furthermore, the pathogen prevalence hypothesis suggests that collectivists are more likely to consider the interests of others than to focus solely on their own interests (Arnocky, 2007); and collectivism is more likely than individualism to promote individuals to adopt health behaviors and protective collective behaviors such as vaccination in the face of epidemics (Murray, 2011). Therefore, the hypothesis of this study was that significant positive relationships among vertical collectivism, individuals' health behaviors and COVID-19 vaccine intention (H1).

1.2 The Mediating Role of COVID-19 Attitudes

For individuals, public health policies/recommendations may bring some economic and psychological costs. The effectiveness of these measures depends on public attitudes toward COVID-19 (Galasso, 2020), which influences an individual's response to emotions (Ahmed, 2020). Numerous studies have shown that attitudes have a direct impact on individuals' behavior, such as COVID-19-related studies have shown that COVID-19 attitudes are significantly and positively associated with the frequency of behaviors, such as keeping social distance, washing hands, and sanitizing (Shook, 2020).

Vertical collectivism can evoke individuals' concerns about collective threats and thus increase their worries about such threats (Xiao, 2021). Furthermore, the Process-Person-Context-Time Model suggests that there is a "distal and proximal" distinction between the factors that influence individual development (Bronfenbrenner, 2005). The "distal factors" influence individual behavior through the mediation of the "proximal factor". In the present study, vertical collectivism as an individual value can be considered as a distal factor, while COVID-19 attitude as an influenced emotional state can be

considered as a proximal factor. Therefore, this study hypothesized that COVID-19 attitudes mediate between vertical collectivism, health behaviors, and COVID-19 vaccine intentions (H2).

2 RESEARCH METHOD

2.1 Participants

This study adopted the method of online survey research, and a total of 2511 subjects participated in this study. Finally, 2244 valid questionnaires were obtained, with the efficiency of questionnaire was 89.37%. Among them, 810 (36.10%) were male and 1434 (63.90%) were female. The average age of the subjects was 22.06 years (SD = 7.22).

2.2 Measurements

2.2.1 Health Behavior

The Coronavirus Safety Behaviors Scale was used to assess the individuals' health behaviors during the new crown outbreak, which consists of 9 items with a 11-point scale as score (0 "none" ~ 10 "very much") (Knowles, 2021). Higher scores indicated a higher frequency of hygienic behaviors among individuals. The Cronbach's α coefficient for this scale in the present study was 0.89.

2.2.2 COVID-19 Vaccination Intention

The Vaccine Behavioural Intentions scale developed by Head et al. was used, which consists of 2 items. The question was scored on an 11-point scale (0 "very unlikely" ~ 10 "very likely") (Head, 2020). The higher the score, the more likely the individual was to be vaccinated. In this study, Cronbach's α coefficient for this scale was 0.71.

2.2.3 COVID-19 Attitude

The COVID-19 attitude scale including 7 items was modified from the Swine Flu inventory to assess individuals' concerns about the spread of the COVID-19 virus (Wheaton, 2012). The questionnaire was scored on an 11-point scale (0 "very unlikely" ~ 10 "very likely"). Higher scores indicated that the individual was more worried about the spread of the COVID-19 virus. The Cronbach's α coefficient for this scale in this study was 0.82.

2.2.4 Vertical Collectivism

The vertical collectivism subscale of the individualism-collectivism questionnaire revised by Wang et al. was used, which consists of 3 items on a 5-point scale (1 "totally disagree" ~ "totally agree") (Yongli, 2003). The higher the score, the higher the individual's level of vertical collectivism. The Cronbach's α coefficient for this subscale in this study was 0.77.

2.3 Data Analysis Method

In this study, R was used to analyze the data, rstatix package was used to conduct descriptive statistics, psych package was adopted to reliability test, and lavaan package was used for testing path analysis.

3 RESULTS

3.1 Descriptive Statistical Results

Correlation analysis showed (see Table 1) that age was significantly and positively correlated with vertical collectivism, COVID-19 attitudes, and health behaviors; gender was significantly and positively correlated with vertical collectivism, COVID-19 attitudes, and negatively correlated with health behaviors; vertical collectivism was significantly and positively correlated with COVID-19 attitudes, health behaviors, and COVID-19 vaccine intentions. There was a significant positive correlation between COVID-19 attitude and health behavior, and COVID-19 vaccine willingness; there was a

significant positive correlation between health behavior and COVID-19 vaccine willingness.

3.2 Mediating Model Test

In this study, gender and age were included as control variables in the mediation model, vertical collectivism as the independent variable, COVID-19 attitude as the mediating variable, health behaviors and vaccination intentions as the dependent variables. The results of path analysis showed that vertical collectivism ($\beta = 0.29$, $se = 0.02$, 95% CI = [0.25, 0.33]), age ($\beta = 0.10$, 95% CI = [0.06, 0.14]) and gender ($\beta = 0.04$, 95% CI = [0.005, 0.084]) were significant positive predictors of COVID-19 attitudes. The positive effect of COVID-19 attitudes ($\beta = 0.17$, $se = 0.02$, 95% CI = [0.13, 0.21]) and vertical collectivism ($\beta = 0.30$, $se = 0.02$, 95% CI = [0.26, 0.34]) were significant positive predictors of health behaviors, whereas age ($\beta = -0.06$, $se = 0.02$, 95% CI = [-0.10, -0.02]) and gender ($\beta = -0.10$, $se = 0.02$, 95% CI = [-0.13, -0.06]) had a significant negative predictive effect on health behaviors. COVID-19 attitudes ($\beta = 0.12$, $se = 0.02$, 95% CI = [0.08, 0.16]) and vertical collectivism ($\beta = 0.16$, $se = 0.02$, 95% CI = [0.12, 0.20]) had a significant positive predictive effect on COVID-19 vaccination intention, while age ($\beta = -0.05$, $se = 0.02$, 95% CI = [-0.09, -0.01]) had a significant positive predictive effect on COVID-19 vaccination. There was a significant negative predictive effect of intention and a non-significant effect of gender ($\beta = -0.04$, $se = 0.02$, 95% CI = [-0.08, 0.01]) on COVID-19 vaccination intention. See Figure 1 for details.

Table 1: Results of descriptive statistics for each variable.

	1	2	3	4	5	6
1 Age	—					
2 Gender	-0.03	—				
3 Vertical collectivism	0.28***	0.10**	—			
4 Health behaviors	0.06*	-0.05*	0.33***	—		
5 COVID-19 vaccine intention	0.02	-0.01	0.18***	0.34***	—	
6 COVID-19 attitudes	0.18***	0.07*	0.32***	0.25***	0.16***	—
<i>M</i>	22.06	0.36	5.20	8.37	7.81	6.63
<i>SD</i>	7.22	0.48	1.03	1.52	2.03	1.46

Note: $n = 2244$. * $p < .05$, ** $p < .01$, *** $p < .001$, Gender as a dummy variable, 0 = male, 1 = female.

Mediating effects were further examined using a bias-corrected percentile nonparametric bootstrap procedure. The indirect effect of vertical collectivism

via COVID-19 attitudes on health behaviors was 0.049 ($se = 0.007$, $p < 0.001$, 95% CI = [0.036, 0.062]) and the indirect effect of vertical collectivism

via COVID-19 attitudes on COVID-19 vaccination intentions was 0.035 (se = 0.007, $p < 0.001$, 95% CI = [0.021, 0.048]).

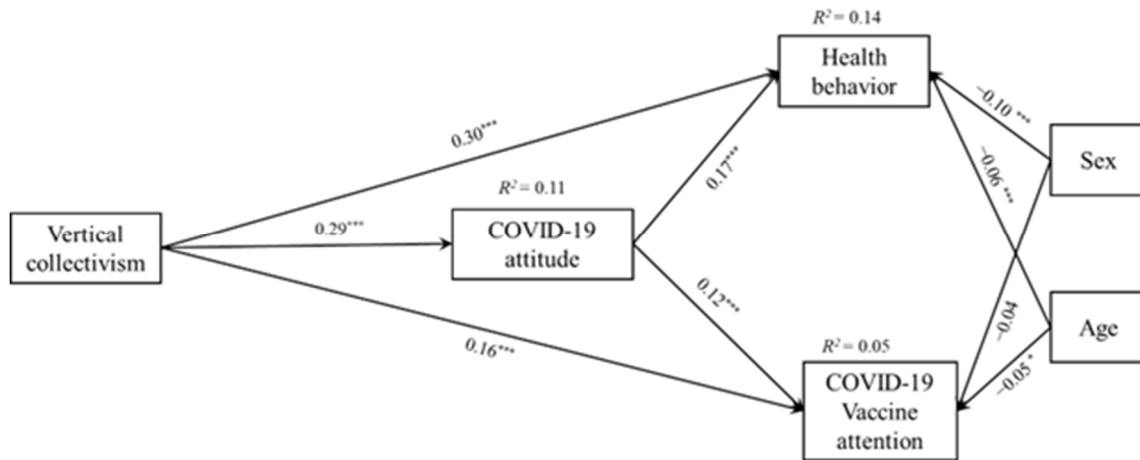


Figure 1: A mediation model for Covid-19 attitude.

4 DISCUSSION

This study found a significant positive predictive effect of vertical collectivism on individuals' health behaviors and COVID-19 vaccine intention; and the results are consistent with previous studies (Biddlestone, 2020). This result better explained the current status quo, where individuals in collectivist cultural areas have relatively higher levels of health behaviors (e.g., mask-wearing rates) and vaccination rates. The attachment theory suggests that individuals activate instinctive attachment system when facing with threats such as death, illness, or failure. Thus individuals develop a deep-seated and largely unconscious desire to avoid isolation from others, to seek closeness and support from close groups; and to respond positively to people or in-group members who support their cultural values (Pyszczynsk, 1997). This is especially true for collectivists, where adherence to social norms is an important response to a collective crisis (Murray, 2011). In addition, high collectivists are subject to more moral and interpersonal pressures (MENG, 2021). The more individuals need the collective (high-vertical collectivists), the more likely they are to "protect the collective" or "conform to collective norms" when the collective is under greater threat (the group places more emphasis on "group guarding" behaviors) to avoid being judged as unethical, thus leading them to act in a way that protects the collective (e.g., healthier behaviors and higher willingness to take the COVID-19 vaccine).

In addition, this study found that COVID-19 attitudes mediated the relationship between vertical collectivism, health behaviors, and COVID-19 vaccine intentions. Significant differences in current prevention behaviors remain between people in different regions (Anderson, 2020). Variables such as cultural value will help shed light on the above issues. Cultural psychology focuses on two dimensions: individualism, which emphasizes individual needs over group needs; and collectivism, which emphasizes group needs above individual needs (Hofstede, 2010). The pathogen prevalence hypothesis argues that collectivism is more likely to promote protection against epidemics than individualism (Murray, 2011). As collectivism places more emphasis on in-group vigilance (Liu, 2019), this may contribute to people's intention to prevent COVID-19 by increasing the level of concern and worry about COVID-19. On the other hand, as pointed out by the theory of Planned Behavior, COVID-19 attitudes toward subjective norms like collectivism (Subject Norm) significantly increase individuals' adoption of health behaviors and increase the willingness to adopt healthy behaviors, such as vaccine. This result validates the pathogen epidemic hypothesis that culture is a very important influence on the behavior of the population during a pathogen pandemic, and that the government can increase the behavior of the population to protect themselves and the collective by promoting collectivism.

REFERENCES

- Ahmed O, Faisal R A, Sharker T, Lee S A and Jobe M C 2020 Adaptation of the Bangla version of the COVID-19 Anxiety Scale *Int. J. Ment. Health Addict.* 1–12
- Anderson R M, Heesterbeek H, Klinkenberg D and Hollingsworth T D 2020 How will country-based mitigation measures influence the course of the COVID-19 epidemic? *The lancet* **395** 931–4
- Arnocky S, Stroink M and DeCicco T 2007 Self-construal predicts environmental concern, cooperation, and conservation *J. Environ. Psychol.* **27** 255–64
- Biddlestone M, Green R and Douglas K M 2020 Cultural orientation, power, belief in conspiracy theories, and intentions to reduce the spread of COVID-19 *Br. J. Soc. Psychol.* **59** 663–73
- Bronfenbrenner U 2005 *Making human beings human: Bioecological perspectives on human development* (sage)
- Bogaert S, Boone C and Declerck C 2008 Social value orientation and cooperation in social dilemmas: A review and conceptual model *Br. J. Soc. Psychol.* **47** 453–80
- Galasso V, Pons V, Profeta P, Becher M, Brouard S and Foucault M 2020 Gender differences in COVID-19 attitudes and behavior: Panel evidence from eight countries *Proc. Natl. Acad. Sci.* **117** 27285–91
- Head K J, Kasting M L, Sturm L A, Hartsock J A and Zimet G D 2020 A national survey assessing SARS-CoV-2 vaccination intentions: implications for future public health communication efforts *Sci. Commun.* **42** 698–723
- Hofstede G and Minkov M 2010 Long-versus short-term orientation: new perspectives *Asia Pac. Bus. Rev.* **16** 493–504
- Huang F, Ding H, Liu Z, Wu P, Zhu M, Li A and Zhu T 2020 How fear and collectivism influence public's preventive intention towards COVID-19 infection: a study based on big data from the social media *BMC Public Health* **20** 1–9
- Kim J H, Marks F and Clemens J D 2021 Looking beyond COVID-19 vaccine phase 3 trials *Nat. Med.* **27** 205–11
- Knowles K A and Olatunji B O 2021 Anxiety and safety behavior usage during the COVID-19 pandemic: The prospective role of contamination fear *J. Anxiety Disord.* **77** 102323
- Lewnard J A and Lo N C 2020 Scientific and ethical basis for social-distancing interventions against COVID-19 *Lancet Infect. Dis.* **20** 631–3
- Liu S S, Morris M W, Talhelm T and Yang Q 2019 Ingroup vigilance in collectivistic cultures *Proc. Natl. Acad. Sci.* **116** 14538–46
- MENG X, LI Q, ZHOU Y and WANG J 2021 Controversies in terror management theory research and its implications for research on the psychology of death *Adv. Psychol. Sci.* **29** 492
- Murray D R, Trudeau R and Schaller M 2011 On the origins of cultural differences in conformity: Four tests of the pathogen prevalence hypothesis *Pers. Soc. Psychol. Bull.* **37** 318–29
- National Health Commission of the PRC *Prevention and control of COVID19*
- Pyszczynski T, Greenberg J and Solomon S 1997 Why do we need what we need? A terror management perspective on the roots of human social motivation *Psychol. Inq.* **8** 1–20
- Singelis T M, Triandis H C, Bhawuk D P and Gelfand M J 1995 Horizontal and vertical dimensions of individualism and collectivism: A theoretical and measurement refinement *Cross-Cult. Res.* **29** 240–75
- Shook N, Sevi B, Lee J, Fitzgerald H and Oosterhoff B 2020 Who's listening? Predictors of concern about COVID-19 and preventative health behaviors
- Van Lange P A M, Joireman J, Parks C D and Van Dijk E 2013 The psychology of social dilemmas: A review *Organ. Behav. Hum. Decis. Process.* **120** 125–41
- Wheaton M G, Abramowitz J S, Berman N C, Fabricant L E and Olatunji B O 2012 Psychological predictors of anxiety in response to the H1N1 (swine flu) pandemic *Cogn. Ther. Res.* **36** 210–8
- WHO 2020 Coronavirus disease (COVID-19) Situation Report – 198
- Xiao J 2021 Decoding new normal in education for the post-COVID-19 world: Beyond the digital solution *Asian J. Distance Educ.* 16 141–55
- Yongli W, Kan S and Xu H 2003 A confirmatory study on the structure of individualism and collectivism in China *Psychol. Sci.-SHANGHAI-* 26 996–9.