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Attitudes toward COVID-19 vaccines and vaccine uptake intent in China: The role of collectivism, interpersonal communication, and the use of news and information websites

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A B S T R A C T
Vaccines can be an effective way to help prevent COVID-19 infections. However, in the age of “infodemic” and people holding different values, promoting COVID-related prevention can be difficult. Based on a survey of 460 Chinese residents in March 2021, the present analysis aims to provide a detailed understanding of the role of values and information sources on the Chinese’s attitudes toward COVID-19 vaccines and their vaccination intent. Results revealed that collectivism and the use of mainstream websites were positively associated with value-expressive attitudes, trust toward vaccines, and norms, which in turn predicted vaccination intent. Furthermore, collectivism was negatively associated with attitudes toward inconvenience or minor side effects, whereas interpersonal communication was positively associated with such attitudes. Overall, collectivism appeared to be a much stronger predictor of the Chinese’s vaccination intent than the media and interpersonal communication. Although this research was conducted in China, where the pace of mass vaccination was fast, the results can provide insights on what might contribute to the success or failure of a vaccination campaign and be used to compare COVID-19 vaccination campaigns in other countries.

1. Introduction

Vaccinating against COVID-19 is probably the easiest way to put the COVID-19 pandemic under control, compared to the lockdown measures or facemask wearing that carry an emotional and physical toll. On December 15, 2020, COVID-19 vaccines became available for priority groups in China (NHPPC, 2020a). By December 17, 2021, 2.65 billion doses had been administered to over 85% of a population of 1.4 billion (NHPPC, 2021a). Given this high vaccination rate, it is important to understand why the Chinese were willing to receive COVID-19 vaccination.

The present analysis is based on a survey conducted in March 2021 when most people in China had not been vaccinated. It is not based on the participants’ retrospective recall of their attitudes and behavioral intent. At the practical level, such an analysis can provide an understanding of why the Chinese are willing to be inoculated and can provide practical implications for future vaccination campaigns, either getting a booster shot against COVID-19 or other infectious diseases.

At the theoretical level, the present analysis is guided by the reasoned action theoretical framework (Fishbein and Ajzen, 2010), where detailed attitudinal variables and norms are incorporated. Furthermore, this analysis will examine the roles of collectivism (i.e., collectivist values) and interpersonal and mediated communication, two variables that might be key to vaccination intent. Recent research examined the correlation between collectivism and behaviors to prevent COVID-19 (e.g., mask use; Lu et al., 2021), but Lu et al. did not examine the mechanism through which collectivism was related to preventive behaviors. Furthermore, given the myriad of information related to COVID-19 and COVID-19 vaccines (i.e., infodemic; World Health Organization [WHO], 2020), it is important to investigate if and how different information sources have an impact on the Chinese’s vaccination intent. In essence, the present investigation will examine the antecedents and mediators of the Chinese’s vaccination intent to provide an account of more detailed theoretical relationships.

1.1. The reasoned action theoretical framework

The reasoned action framework (Fig. 1) has been used to explain why individuals perform various behaviors, including preventive behaviors (Fishbein and Ajzen, 2010). The main structural relationships in the theory state that individuals’ attitudes (i.e., favorable or unfavorable evaluation of a behavior), subjective (i.e., perceived approval of performing a behavior) and descriptive norms (i.e., perceived popularity of a behavior), and self-efficacy (i.e., perceived ability to perform a behavior) predict their intentions to perform a behavior. Their intentions, in turn, predict the actual performance of a behavior. Previous meta-analyses
and narrative analyses have found that the theoretical framework can explain a large amount of variance in intentions and behaviors (e.g., Armitage and Conner 2001, Fishbein and Ajzen 2010). In general, attitudes are the strongest predictor of intentions, whereas norms are the weakest (Armitage and Conner, 2001; Fishbein and Ajzen, 2010). Despite such evidence, the model continues to be refined and expanded.

Instead of using a general conception of attitudes, the present research classifies attitudes based on the functions a behavior serves (Katz, 1960): a utilitarian function (i.e., related to the basic, intrinsic aspects of a behavior or product), a value-expressive function (i.e., the performance of a behavior allows an individual to express values or form an identity), and an ego-defensive or externalization function (i.e., to defend one’s self-esteem or ego from either real or imagined threat). Wang (2009) states that individuals can form different attitudes toward an attitude object (e.g., a health behavior) and that the attitude functional approach can provide a meaningful typology to classify attitudes and reveal the underlying motivations for performing a behavior.

Such refined attitudes are relevant to COVID-19 vaccine uptake in China and elsewhere. First, the utilitarian attitudes mean the intrinsic, basic aspects of getting COVID-19 vaccination. These aspects involve making an appointment, going to a site, and potentially interrupting one’s daily activities. Localized pain and other bodily reactions (e.g., fever) are possible (WHO, 2021). Second, the value-expressive function is related to one’s motivations to express values of being a good, responsible person and is related to one’s public and private identity. Prevention behaviors to contain COVID-19 are considered a “public good” (Cato et al., 2020); getting vaccinated was considered a way to help build herd immunity in the nation and express values of being caring and willing to help. On the other hand, refusing to perform such behaviors can be perceived as reckless and not taking necessary precautions. Thirdly, the externalization function often attributes the root of a cause to external reasons, whether imagined or real. There have been concerns about the possible major side effects or the safety of COVID-19 vaccines. Indeed, some may refuse to vaccinate by attributing their refusal to these external issues instead of their unwillingness. We thus treat concerns about or lack of trust toward COVID-19 vaccine safety as a form of externalization, that is, attributing the cause of one’s hesitancy to external reasons.

Regarding norms, it is safe to state that although voluntary, there is an expectation from the Chinese government and society that individuals get vaccinated against COVID-19 (i.e., subjective norms). Given the progress made on COVID-19 vaccination in China, the National Health Commission of the People’s Republic of China (e.g., NHCPPC 2021a) provided frequent updates on its websites, and the media relayed such information. The author’s and many others’ observations (e.g., Machingaidze and Wyssonge 2021) revealed that many individuals discussed or posted their vaccination status via interpersonal communication or social media. Machingaidze and Wyssonge observed that the internet and social media aided the diffusion of information, a “key component of vaccination decision-making.” However, such channels may present misinformation, incomplete information, and unclear information.

Because the weight of each variable in predicting behavioral intentions varies by group and behavior, it should be determined empirically (Fishbein and Ajzen, 2010). As such, the following research questions, instead of hypotheses, are asked.

**RQ1:** Do utilitarian and externalization attitudes negatively predict the Chinese’s vaccination intent, and (b) do value-expressive attitudes positively predict their vaccination intent?

**RQ2:** Do subjective and descriptive norms positively predict the Chinese’s vaccination intent?

### 1.2. Cultural value: collectivism

The reasoned action theoretical framework states that distal variables predict attitudes, norms, and self-efficacy (Fig. 1; Fishbein and Ajzen 2010).
Ajzen, 2010). These distal variables include, for example, media campaigns and cultural values. In particular, the present analysis examines the role of collectivism and communication channels.

The present research focuses on the traditional, core meaning of collectivism. Collectivism emphasizes cooperation and the group over the individual (Brewer and Chen, 2007; Triandis and Gelfand, 1998). Collectivists value cooperation, group work, and family and community. On the opposite end, individualists focus on individual freedom and autonomy and put themselves first before the group. Traditionally, collectivist and individualistic cultural values are considered the characteristics of East Asian cultures and Western cultures, respectively (Hofstede, 2001). However, there can be variations among different peoples or groups within one culture or country. Talhelm et al. (2014) found that historically, Chinese southerners were more collectivist than northerners because growing rice in the past required cooperation in fetching water and distributing water fairly.

Collectivism is one important cultural value related to preventive measures that require collective efforts from everyone. The countries or states that were collectivist were more likely to adopt measures to prevent COVID-19 (e.g., face mask-wearing) and had lower COVID-19 infection and death rates (Lu et al., 2021; Rajkumar, 2021). However, these analyses were based on secondary data and did not examine the mechanism of how collectivism influenced preventive behaviors. Fig. 1 shows that the role of collectivism on behavioral intent should be mediated by attitudes, norms, and efficacy.

By using the more detailed attitudes based on the functions that they serve, it is possible to provide theory-based predictions on the relationships between the distal variables (e.g., collectivism) and the specific attitudes. COVID-19, an infectious disease, requires collective efforts that help prevent oneself from contracting the disease and spreading it to others (Centers for Disease Control and Prevention, 2021). Collectivists (vs. individualists) would be more likely to be concerned about others’ welfare and consider the benefits of preventive measures to larger communities. As such, they (vs. individualists) are more likely to develop value-expressive attitudes toward the preventive measures (e.g., getting COVID-19 vaccination) that may bring about collective benefits. Furthermore, because collectivists value cooperation with others and the need for cooperation promotes trust (Shin and Park, 2005), they are generally more trusting of others. They are also less likely to consider the performance of good behaviors cumbersome (i.e., utilitarian attitudes), compared to the individualists. Furthermore, collectivists have stronger subjective norms because collectivist groups are more likely to impose rules and expectations and also have stronger descriptive norms by paying attention to their surroundings. By contrast, individualists are likely to ignore or disagree with subjective norms. Taken together, the following hypotheses related to the direct relationships are proposed:

H1: Collectivists (vs. individualists) have more favorable value-expressive attitudes and less strong externalization attitudes and utilitarian attitudes.
H2: Collectivists (vs. individualists) have stronger subjective norms and descriptive norms.

1.3. Interpersonal communication and use of information websites

According to Fishbein and Ajzen (2010), media and interpersonal communication are distal variables that predict attitudes, norms, and efficacy, which in turn predict behavioral intent. Several theories can be used to address the effects of media and interpersonal communication. First, social cognitive theory (Bandura, 2002) states that individuals acquire knowledge and beliefs by observing the examples in the media and their immediate environment. Individuals will develop more favorable outcome expectations (e.g., attitudes toward either tangible or intangible outcomes) and what behaviors are appropriate (e.g., subjective norms) if the examples in the media or the immediate environment are rewarded than punished. Second, cultivation analysis (Gerbner et al., 2002) states that those who use the media more often are more likely to overestimate the frequency of a behavior in real life to be consistent with the frequency of the behavior portrayed or reported in the media (e.g., descriptive norms). Thirdly, Rimal and Real (2005) state that norms are communicated through the media or interpersonal channels. It is expected that subjective norms (i.e., what is expected) can both be taught and verbally communicated and be deduced from others’ behaviors. Descriptive norms can be verbally communicated (i.e., news articles describing how many have been vaccinated) and directly observed.

Although it is reasonable to assume that there has been a heavy promotion of COVID-19 vaccination and misinformation about COVID-19 vaccinations, no systemic research thus far has examined the Chinese media reporting and social media conversations about COVID-19. Without knowing the content in the media, it is not possible to specify the exact relationships between media exposure and attitudes, norms, and efficacy. As such, a research question is asked regarding the role of the use of news and information websites and interpersonal communication.

RQ3: How is interpersonal communication related to individuals’ attitudes and norms toward COVID-19 vaccination?

RQ4: How is the use of news and information websites related to individuals’ attitudes and norms toward COVID-19 vaccination?

1.4. Control variables

This research will control for demographic variables (e.g., gender and annual income) and future orientation. Future orientation is an individual’s tendency to consider future consequences (Strathman et al., 1994). Those with a higher tendency (vs. lower) to consider future consequences usually hold more favorable attitudes toward health or environmental behaviors and will be more persuaded by future-oriented appeals (Orbell et al., 2004; Strathman et al., 1994). Furthermore, those with a higher tendency consider future consequences are more likely to think abstractly and consider the potential gain and benefits in the future (e.g., locking the house to secure the house). On the other hand, less future-oriented people focus on the logistics of a behavior (e.g., turn the key to lock a door) and consider potential losses (Liberman et al., 2002). That is, when facing the decision to get vaccinated against COVID-19, those with a strong future orientation are more likely to consider the benefits of performing a behavior and less likely to consider the logistics of performing a behavior.

2. Method

2.1. Sample

The present analysis is based on part of the data collected in China on March 15 and 16, 2021. By mid-March 2021, approximately 0.8 billion vaccine doses were administered in China (NHCPRC, 2021). Between April 17, 2020 (when Chinese revised COVID-19 death statistics) and March 14, 2021, 7330 were diagnosed with COVID-19 and 2 died of COVID-19 in China (NHCPC, 2020b, 2021b).

The protocol and the questions were approved by the Human Subjects Office at the Rochester Institute of Technology in the United States. WJX.com, a Chinese online survey panel provider, coordinated data collection and was paid approximately US$2 for each completed case. WJX’s online panel was recruited from the participants who previously participated in the surveys hosted on its website. Its algorithm excluded those who did not complete the survey or failed attention-check questions. The participants received monetary rewards for their participation. WJX.com provided a final sample of 460 cases, all used in the data analysis. The response rate was approximately 29%. A power analysis was conducted to determine the minimum sample size. Based on the media effects and attitude literature, assuming a small effect size (0.14) of an antecedent variable (e.g., media) to a mediator (e.g., attitudes) and
Table 2

| Scale and questionnaire item                                                                 | Standardized factor loading |
|---------------------------------------------------------------------------------------------|-----------------------------|
| Utilitarian attitudes ($\alpha = 0.76$)                                                       |                             |
| - The process of getting COVID-19 vaccination is not convenient                              | .74                         |
| - Getting vaccinated against COVID-19 will hurt                                              | .63                         |
| - The process of getting vaccinated against COVID-19 will disrupt my daily activities        | .83                         |
| Value-expressive attitudes ($\alpha = 0.78$)                                                  |                             |
| - My getting COVID-19 vaccination shows I care about others’ health                          | .61                         |
| - ... can help achieve herd immunity                                                        | .57                         |
| - ... shows I'm a responsible person                                                         | .77                         |
| - ... shows I'm willing to contribute my part to collectively overcome the disease           | .65                         |
| - ... shows I have good values                                                               | .77                         |
| Externalization attitudes ($\alpha = 0.69$)                                                   |                             |
| - COVID-19 vaccines do not have major side effects                                           | .60                         |
| - COVID-19 vaccines are safe to use                                                           | .97                         |
| Subjective norms ($\alpha = 0.81$)                                                            |                             |
| - Regarding getting COVID-19 vaccination when available to me                                | .86                         |
| - ... my community expects to do so                                                          | .88                         |
| - ... the government expects to do so                                                        | .85                         |
| Descriptive norms ($\alpha = 0.83$)                                                           |                             |
| - Many of my friends and neighbors have received COVID-19 vaccination                        | .89                         |
| - some of my family have received COVID-19 vaccination                                       | .85                         |
| - many Chinese have received COVID-19 vaccination                                            | .70                         |
| Self-efficacy ($\alpha = 0.75$)                                                               |                             |
| - If I’m willing, I know how to get vaccinated                                               | .57                         |
| - I know the procedure to get vaccinated                                                     | .86                         |
| - I know where to get vaccinated                                                            | .85                         |
| - No external reasons can prevent me from getting vaccinated                                  | .55                         |
| COVID-19 vaccination intent ($\alpha = 0.91$)                                                 |                             |
| - Thinking about the near future, when a vaccine is available to me (or when I become eligible), | .91                         |
| - ... I would like to get vaccinated                                                        |                             |
| - ... I expect to get vaccinated                                                             | .89                         |
| - ... I plan to get vaccinated                                                               | .90                         |
| Collectivism ($\alpha = 0.78$)                                                                |                             |
| - Everyone needs to contribute to their group                                                 | .74                         |
| - to me, it is important to respect and follow the group decision                            | .75                         |
| - the well-being of those who I know is important to me                                      | .61                         |
| - we need to cooperate with others                                                           | .63                         |
| - everyone should make some sacrifices to a better world                                       | .62                         |
| Use of news and government websites for COVID and vaccine information ($\alpha = 0.85$)        |                             |
| - mainstream news websites (e.g., sohu.com or sina.com) for COVID information                | .58                         |
| - websites sponsored by governments (e.g., Xinhuanet.com) for COVID information                | .86                         |
| - local news websites for COVID information                                                   | .66                         |
| - mainstream news websites (e.g., sohu.com or sina.com) about COVID vaccines                  | .65                         |
| - websites sponsored by governments (e.g., Xinhuanet.com) about COVID vaccines                | .84                         |
| - local news websites about COVID vaccines                                                    | .65                         |
| Interpersonal communication about COVID and vaccines ($\alpha = 0.87$)                        |                             |
| - communication about COVID-19 via phone or in-person                                        | .71                         |
| - communication about COVID-19 through WeChat.                                                | .87                         |
| - communication about COVID-19 vaccines via phone or in-person                                | .82                         |
| - communication about COVID-19 vaccines through WeChat.                                       | .88                         |
| Future orientation ($\alpha = 0.65$)                                                          |                             |
| - I try to influence future outcomes through my day-to-day activities                         | .54                         |
| - I’m willing to sacrifice my immediate happiness to achieve long-term outcomes             | .74                         |
| - I often engage in a particular behavior to achieve outcomes that may not result for many years.” | .73                         |

Note. $N = 460$, $\chi^2 = 1514.6$, df = 724, $p < .001$, root mean square error of approximation (RMSEA) = 0.049, 90% CI of RMSEA [0.45 to 0.052], comparative fit index = 0.98, and standardized root mean square residual = 0.064. Scales were adapted from previous scales or constructed based on the definitions in the literature.

2.2. Questionnaire

After viewing an informed consent letter, participants answered questions related to their attitudes, norms, vaccination intent, emotions, media use, interpersonal communication, values, attitudes toward vaccine exports, and socio-demographic questions. Participants were not given other types of information to read (e.g., information articles or ads about COVID-19 vaccines) before completing this survey. Questions used in the analysis are listed in Table 2. Responses to these questions ranged from 1 (strongly disagree) to 7 (strongly agree) unless otherwise noted. Cronbach alpha coefficients showed that the reliabilities of the scales reported were generally good or adequate.

2.2.1. Three types of attitudes

Attitudinal questions were constructed based on a review of the definitions of attitude functions in the literature (e.g., Katz 1960, Shavitt 1990) and a pilot study of 11 Chinese’s beliefs about COVID-19 vaccination. These definitions and specific beliefs guided the construction of the attitudinal questions. Table 2 presents the items used to measure utilitarian attitudes ($\alpha = 0.76$), value-expressive attitudes ($\alpha = 0.78$), and externalization attitudes ($\alpha = 0.69$).

Externalization attitudes were initially measured by the following items: "COVID-19 vaccines do not have major side effects," "COVID-19 vaccines are safe to use," "COVID-19 vaccines can lead to serious bodily reactions," and "we need more time to fully understand the side effects of a small-medium effect size of the mediator to vaccination intent (0.26) and a power of 0.80, the required sample size for the percentile bootstrap method (PROCESS MACRO) is 412 (Fritz and MacKinnon, 2007). Sample characteristics are presented in Table 1.
of COVID-19 vaccines. After an analysis of the items based on confirmatory factor analysis (e.g., factor loadings) and reliability analysis, the first two items were retained to signify less externalization attitudes or more trust toward COVID-19 vaccines (α = 0.69).

2.2.2. Subjective and descriptive norms

Subjective norms (α = 0.81) and descriptive norms (α = 0.83) were measured by three items each based on the definitions and examples from Fishbein and Ajzen (2010) and Conner and Sparks (1996).

2.2.3. Vaccination intentions

Intentions (α = 0.91) were measured by three items adapted from Conner and Sparks (1996).

2.2.4. Collectivism

Collectivism was measured by five items (α = 0.78) selected from Triandis and Gelfand (1998) and Realo et al. (1997).

2.2.5. Use of news and information websites and interpersonal communication

Media use and interpersonal communication were measured using questions related to the COVID-19 disease and COVID-19 vaccines separately based on a 7-point scale ranging from 1 (never) to 7 (very frequently). The media channels initially included broadcast TV news, mainstream news websites (e.g., sohu.com or sina.com), websites sponsored by governments (e.g., Xinhuanet.com), local news websites, and nontraditional news media (e.g., via social media). Interpersonal communication channels included communication about COVID-19 and COVID-19 vaccines via phone or in-person and through WeChat.

Exploratory factor analysis showed that two factors emerged with an eigenvalue greater than 1: use of news and information websites (6 items, α = 0.85) and interpersonal communication (4 items, α = 0.87).

2.2.6. Control variables

Additional socio-demographic variables (e.g., age, gender, education, and income), future orientation, and personal philosophy (1 = conservative, 7 = liberal) were included at the end of the questionnaire. Future orientation (α = 0.65) was based on three items selected from Strathman et al. (1994).

3. Results

The analysis used multiple regression to examine the direct effects of various variables listed in the preceding and Hayes’ PROCESS MACRO (model 4) to examine the mediating effects. This analysis used collectivism, the use of news and information websites, and interpersonal communication as the independent variables and intentions to get vaccinated against COVID-19 as the dependent variable. Furthermore, utilitarian attitudes, value-expressive attitudes, externalization attitudes, norms, and self-efficacy were mediators. Means and Pearson correlations are shown in Table 3. Unstandardized beta coefficients and standard errors for the direct effects are shown in Table 4, and indirect and total effects in Table 5. Standardized beta coefficients are reported below and in Fig. 2. Following Cohen (1988), standardized coefficients of less than 0.20, between 0.20 and 0.39, and greater than 0.40 are small, medium, and strong effect sizes, respectively.

For RQ1, Fig. 2 showed that after controlling for the socio-demographic variables and future orientation, more positive value-expressive attitudes (β = 0.21, p < .001), less externalization attitudes/more trust (β = 0.15, p < .001) positively predicted the Chinese’s vaccination intentions, but utilitarian attitudes did not predict their vaccination intentions (β = −0.05, p = .171).

For RQ2, injunctive norms (β = 0.36, p < .001) and descriptive norms (β = 0.12, p = .004) positively predicted the Chinese’s vaccination intent. The effect sizes of value-expressive attitudes and injunctive norms

|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| 1. Sex (1 = male, 2 = female) | −11 | 24 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2. Age | −0.19 | 0.24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3. Education | −0.06 | 0.15 | 0.08 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4. Political orientation | −0.04 | 0.01 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5. Future orientation | −0.01 | 0.10 | 0.17 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6. Collectivism | −0.01 | 0.09 | 0.18 | 0.08 | −0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7. Use of news websites | 0.00 | 0.05 | 0.09 | 0.02 | 0.06 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8. Use of information websites | 0.00 | 0.05 | 0.08 | 0.01 | 0.08 | 0.07 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9. Utilitarian attitudes | −0.02 | −0.04 | 0.03 | −0.07 | 0.05 | 0.09 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10. Value-expressive attitudes | −0.02 | −0.04 | 0.03 | −0.07 | 0.05 | 0.09 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11. Externalization attitudes | −0.02 | −0.04 | 0.03 | −0.07 | 0.05 | 0.09 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12. Collectivism | −0.02 | −0.04 | 0.03 | −0.07 | 0.05 | 0.09 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13. Subjective norms | −0.02 | −0.04 | 0.03 | −0.07 | 0.05 | 0.09 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14. Injunctive norms | −0.02 | −0.04 | 0.03 | −0.07 | 0.05 | 0.09 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15. Norms | −0.02 | −0.04 | 0.03 | −0.07 | 0.05 | 0.09 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16. Self-efficacy | −0.02 | −0.04 | 0.03 | −0.07 | 0.05 | 0.09 | 0.04 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: N = 480, p < .05 ( Model 017 > 0.09), p < .01 ( Model > 0.12).
on vaccination intentions were moderate, whereas the effect sizes of externalization attitudes and descriptive norms were small.

In addition, self-efficacy ($\beta = 0.02, p = .659$) was not a significant predictor of the Chinese's intentions to get vaccinated. On the other hand, those who held stronger collectivist values ($\beta = 0.10, p = .040$) and more liberal personal philosophy ($\beta = 0.07, p = .047$) had stronger intentions to get vaccinated compared with those with weaker collectivist values and those with more conservative philosophy, respectively. The effect sizes of these relationships were small.

H1 specified the associations between collectivism and attitudes. Consistent with H1, those with stronger collectivist values had more favorable value-expressive attitudes ($\beta = 0.38, p < .001$) and more trust (or less strong externalization attitudes; $\beta = 0.25, p < .001$). On the other hand, stronger collectivist values were negatively associated with utilitarian attitudes toward the inconvenience and minor pain they would experience ($\beta = -0.23, p < .001$). The effect sizes of these attitudes with vaccination intentions were moderate.

H2 specified the association between collectivism and norms. Collectivism positively predicted subjective norms ($\beta = 0.17, p = .003$) and descriptive norms ($\beta = 0.16, p = .010$). This was consistent with H2, but the effect sizes were small.

RQ3 aimed to further examine the role of interpersonal communication (via traditional ways—phone or face-to-face, or via WeChat). The results showed that more frequent interpersonal communication was associated with stronger utilitarian attitudes ($\beta = 0.14, p = .005$). That is, those who discussed more frequently with others via interpersonal

| Table 4 |
| Direct relationships among the control variables, distal predictors, mediators, and Chinese's vaccination intent. |

| Predictor | Utilitarian attitudes | Value-expressive attitudes | Externalization attitudes | Subjective norms | Descriptive norms | Self-efficacy | Vaccination intent |
|-----------|-----------------------|---------------------------|--------------------------|-----------------|-----------------|--------------|-------------------|
|           | B SE                  | B SE                      | B SE                     | B SE            | B SE            | B SE         | B SE              |
| Control Variable |
| Gender | 0.05 0.10 | -0.07 0.07 | -0.15 0.10 | -0.09 0.10 | 0.20 0.13 | 0.00 0.09 | 0.09 0.08 |
| Age | -0.01 0.01 | 0.00 0.00 | 0.01 0.01 | 0.01 0.01 | 0.01 0.01 | 0.01 0.01 | -0.01 0.01 |
| Annual income | -0.01 0.01 | 0.00 0.01 | 0.01 0.01 | 0.02 0.01 | 0.01 0.01 | 0.01 0.01 | 0.00 0.01 |
| Year of education | -0.02 0.01 | 0.00 0.01 | 0.00 0.01 | 0.00 0.01 | -0.03 0.01 | 0.01 0.01 | -0.01 0.01 |
| Personal philosophy | -0.05 0.05 | 0.01 0.03 | 0.07 0.05 | 0.13 0.05 | 0.20 0.06 | 0.10 0.04 | 0.07 0.04 |
| Future orientation | 0.14 0.08 | 0.15 0.05 | 0.13 0.08 | 0.29 0.08 | 0.15 0.10 | 0.13 0.07 | 0.02 0.06 |
| Variable of interest: Distal variable |
| Collectivism | -0.30 0.08*** | 0.39 0.05*** | 0.35 0.09*** | 0.25 0.08*** | 0.29 0.11** | 0.56 0.07*** | 0.15 0.07* |
| Interpersonal communication | 0.14 0.05** | 0.06 0.03* | 0.03 0.05 | -0.02 0.04 | 0.09 0.06 | 0.05 0.04 | -0.02 0.04 |
| Use of news/information websites | -0.11 0.05* | 0.08 0.03** | 0.07 0.05 | 0.13 0.05** | 0.13 0.06* | 0.04 0.04 | 0.02 0.04 |
| Variable of interest: Mediator |
| Utilitarian attitudes | -0.05 0.04 |
| Value-expressive attitudes | 0.32 0.06*** |
| Externalization attitudes | 0.16 0.04*** |
| Subjective norms | 0.40 0.05*** |
| Descriptive norms | 0.10 0.04** |
| Self-efficacy | 0.02 0.05 |

Note. N = 460.

| Table 5 |
| Indirect relationships (mediating) and total relationships among control variables, distal predictors, and the Chinese's vaccination intent. |

| Predictor | via utilitarian attitudes | via value-expressive attitudes | via externalization attitudes | via subjective norms | via descriptive norms | via self-efficacy | Total relationship |
|-----------|---------------------------|-----------------------------|---------------------------|--------------------|----------------------|-----------------|-------------------|
|           | B SE                      | B SE                        | B SE                      | B SE               | B SE                 | B SE           | B SE              |
| Control Variable |
| Personal philosophy | 0.00 0.00 | 0.00 0.00 | 0.01 0.01 | 0.01 0.01 | 0.05 0.02 | 0.02 0.01 | 0.00 0.01 | 0.17 0.05*** |
| Future orientation | -0.01 0.01 | 0.01 0.05 | 0.02* 0.02 | 0.02 0.12 | 0.04** 0.02 | 0.02 0.01 | 0.00 0.01 | 0.22 0.08** |
| Variable of interest: Distal variable |
| Collectivism | 0.02 0.01 | 0.13 0.03** | 0.06 0.02** | 0.10 0.05* | 0.03 0.02 | 0.01 0.04 | 0.49 0.09*** |
| Interpersonal communication | -0.01 0.01 | 0.01 0.02 | 0.01 0.00 | 0.01 -0.01 | 0.02 0.01 | 0.00 0.00 | 0.00 0.05 |
| Use of news/information websites | 0.01 0.01 | 0.03 0.01 | 0.01 0.01 | 0.01 0.05 | 0.02* 0.01 | 0.01 0.01 | 0.00 0.00 | 0.13 0.05* |

Note. N = 460. Gender, age, annual income, and year of education were included in the estimation of the indirect effects. But the indirect effects were very small and nonsignificant.
communication had more unfavorable attitudes toward the convenience and physical pain of getting vaccinated against COVID-19. Furthermore, more frequent interpersonal communication was marginally significant in predicting value-expressive attitudes ($\beta = 0.08, p = .058$).

For RQ4, the results showed that those with more frequent use of the websites had less strong utilitarian attitudes ($\beta = -0.11, p = .040$) and stronger value-expressive attitudes ($\beta = 0.11, p = .009$), subjective norms ($\beta = 0.13, p = .007$), and descriptive norms ($\beta = 0.10, p = .045$). The effect sizes of the relationships were small.

Table 5 shows the indirect and total relationships of collectivism, interpersonal communication, and different websites on the Chinese’s vaccination intent based on unstandardized beta coefficients. The standardized coefficient showed that the total relationship between collectivism and vaccination intent is ($\beta = 0.31, p < .001$), mainly mediated by value-expressive attitudes, subjective norms, externalization attitudes, and descriptive norms. Regarding the total relationships, there was no association between interpersonal communication and vaccination intent ($\beta = 0.00, p = .956$), whereas the total relationship between website use and vaccination intentions was 0.11 ($p = .13$).

Additional findings show that the total associations between personal philosophy and vaccination intentions and between future orientation and vaccination intentions were 0.15 ($p < .001$) and 0.14 ($p = .007$), respectively.

4. Discussion

The present analysis examined the factors that predicted the Chinese’s intentions to get vaccinated against COVID-19 and particularly the role of collectivism and communication channels. The data were collected in March 2021, three months after the vaccines became available for priority groups (NHCPRC, 2020c) and when most Chinese had not been fully vaccinated (NHCPRC, 2021b). The present research has both practical and theoretical implications.

4.1. Theoretical discussion

The present analysis examined the antecedents and mediating relationships within the reasoned action theoretical framework. Although Fishbein and Ajzen (2010) stated that many distal variables predict attitudes, norms, and self-efficacy, they did not further specify such relationships because the number of distal variables was many. The present analysis assumes that when attitudes are conceptualized based on the specific functions they serve (vs. general attitudes-favorable and unfavorable evaluation of a behavior), it presents more nuanced and specific links between the distal variables and reasoned action variables.

First, Fishbein and Ajzen (2010) state that the relative weight of the reasoned action variables on behavioral intent varies by the behavioral type and audience group. The results indicate that for COVID-19 vaccination intentions among the Chinese, subjective norms and value-expressive attitudes, two norm-based variables, were more important than externalization attitudes or descriptive norms (e.g., situation-based variables). Furthermore, utilitarian attitudes (i.e., inconvenience or minor pain) and self-efficacy (i.e., perceived ability or difficulty in getting COVID-19 vaccination) were not important. In general, utilitarian attitudes toward the potential inconvenience and pain were not high ($M = 4.06$ on a 7-point scale, $SD = 1.10$) and manageable. Heavy promotion and free and convenient COVID-19 vaccination might have also made self-efficacy not an important variable in getting vaccinated.

Second, this present analysis found that collectivism was predictive of all mediating variables (various attitudes, norms, and self-efficacy). The patterns were generally consistent with the predictions based on prior research. First, collectivism was positively associated with value-expressive attitudes that getting COVID-19 vaccination can help prevent others from getting infected and help build herd immunity; that is, getting vaccinated is associated with collective benefits. Second, those who were more collectivist had less strong externalization attitudes (i.e., more trusting) and less strong utilitarian attitudes (i.e., more tolerant of inconvenience and pain). Lastly, the relationships between collectivism and norms were significant but weak. But the total relationship between collectivism and the Chinese’s vaccination intentions was fairly large and significant.

Although it confirmed the expectation that collectivism was mediated by attitudes and norms, the analysis identified a weak, direct relationship between collectivist values and vaccination intent. There can be two potential reasons. First, as Fishbein and Ajzen (2010) stated that such residual effects could result from mediators not being per-
fectly conceptualized and measured. Thus, the mediators (e.g., attitudes and norms) do not fully mediate the relationships. Second, contrary to Fishbein and Ajzen, many scholars posit that the influence of culture on decisions and behavior can be direct. For example, Roccas and Sagiv (2010) state that cultural values can be directly associated with behavioral choices and actions and that the direct relationships were too strong to be dismissed. The present analysis revealed a small effect size, which lent weak support for the direct relationship. The small effect size also means that researchers cannot dismiss Fishbein and Ajzen’s (2010) explanation that it was a residual effect due to imperfect measurements. At the moment, it might be prudent to consider both schools of theorizing in future research.

Thirdly, the relationships between the use of news and information websites and the reasoned action variables deserve some discussion. Results in Fig. 2 indicate that interpersonal communication might have touched upon the experience of getting COVID-19 vaccination. In contrast, news or government websites should have promoted the importance of COVID-19 vaccination and provided statistics related to the vaccination progress. The total effect of interpersonal communication on vaccination intent was nonsignificant, whereas that of the use of websites was small (β = 0.11). The total relationship between the use of news and government websites and vaccination intentions was much weaker than that between collectivism and vaccination intentions. There are two explanations for differential effects of values and media use: It is possible that for COVID-19 vaccination programs, values are a very important factor in why people decide to get vaccinated. It is also possible that a variety of information is available on the web and via interpersonal communication (Machingaidze and Wiysonge, 2021). Good information had to compete with misinformation in reaching and persuading the audience. As such, the effects of news and government website use, although still came through, were weakened. Thus, it is important to systematically examine the information in the media.

Finally, most demographic variables were not related to the reasoned action variables (Table 3). Future orientation and personal philosophy predicted some reasoned action variables. Such results were consistent with the literature on future orientation that more future-oriented individuals would be more likely to form intentions and perform behaviors for a future outcome than less future-oriented individuals. Also consistent with the literature, those who are more liberal are more open to new stimuli and experiences (Graham et al., 2013) and thus would form higher intentions to get vaccinated. However, the total relationships between the two variables and vaccination intent were small.

4.2 Practical implications

This present analysis has several practical implications for promoting COVID-19 vaccination. It first identified the social cognitive variables directly related to the Chinese’s COVID-19 vaccination intent, for example, value-expressive attitudes, externalization attitudes, and norms. These variables were fairly strong predictors of vaccination intent. Thus, it can be fruitful to promote ideas such as ‘getting vaccinated is one way to help others and your community’ and ‘it is expected of you to get vaccinated.’ Second, although collectivist values were strongly associated with value-expressive attitudes, the values were only one of the factors and explained appropriately 16% of the variance in value-expressive attitudes. The relationships between collectivist values and norms were weak. Future research should further explore the factors associated with these variables and ways to facilitate changes in value-expressive attitudes and norms, particularly among those with low collectivist values. For example, future research should consider the role of sympathy or harm care in promoting value-expressive attitudes and authority to promote subjective norms. Thirdly, although the relationships were weak, the use of news and government websites was positively related to value-expressive attitudes and norms, which were then related to vaccine uptake intentions. Such results showed that information on the web could be of use in facilitating vaccine uptake. However, the exact mechanism of news and government websites are to be determined: whether the effectiveness of such website use was small or whether the presence of misinformation has reduced the effectiveness of good, authoritative information.

4.3 Limitations and conclusion

Several limitations should be acknowledged before the interpretation of the findings. First, the results were based on a web-based sample. The recruiting method is generally not fully disclosed by the survey panel provider. It is safe to assume that the sample was not representative of the Chinese population. Future promotional programs should conduct formative research to confirm the findings in this analysis. Second, this research was conducted in China in March 2021. The participants may be less worried about their health because COVID-19 was largely contained, and approximately 20 (imported) cases were reported daily. It is possible that participants may be more concerned about their health when there is a surge of COVID-19 cases in China. Third, in other countries where COVID-19 is still a significant problem, participants’ concerns about their health and safety can potentially be an important motivator, which should be dealt with in additional research. Fourth, the present research is based on correlational data and statistical mediation analysis. As such, causal inference cannot be established, and reverse causality is possible. If possible, future research considers serial experiments to establish a causal chain in mediation analysis. Lastly, the COVID-19 situation is still very fluid. Public perceptions of the disease and vaccines can change. Thus, it is important to conduct additional research to understand the public before promoting COVID-19 vaccination.

In summary, this analysis contributes to the reasoned action theoretical framework by examining the pathways from distal variables (i.e., collectivism and communication channels) to vaccination intent in China. To extend Lu et al. (2021) and Rajkumar (2021) on the relationship between collectivism and COVID-related preventive behaviors (e.g., face mask use), this analysis identified the mediating variables that are important for promoting vaccine uptake in China. These mediating variables can be the variables targeted for change if confirmed by the formative research for future vaccination campaigns.

Declaration of Competing Interest

The author declares no conflict of interest in conducting and preparing this manuscript.

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