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Intentions to be Vaccinated Against COVID-19: The Role of Prosociality and Conspiracy Beliefs across 20 Countries

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ABSTRACT

Understanding the determinants of COVID-19 vaccine uptake is important to inform policy decisions and plan vaccination campaigns. The aims of this research were to: (1) explore the individual- and country-level determinants of intentions to be vaccinated against SARS-CoV-2, and (2) examine worldwide variation in vaccination intentions. This cross-sectional online survey was conducted during the first wave of the pandemic, involving 6697 respondents across 20 countries. Results showed that 72.9% of participants reported positive intentions to be vaccinated against COVID-19, whereas 16.8% were undecided, and 10.3% reported they would not be vaccinated. At the individual level, prosociality was a significant positive predictor of vaccination intentions, whereas generic beliefs in conspiracy theories and religiosity were negative predictors. Country-level determinants, including cultural dimensions of individualism/collectivism and power distance, were not significant predictors of vaccination intentions. Altogether, this study identifies individual-level predictors that are common across multiple countries, provides further evidence on the importance of combating conspiracy theories, involving religious institutions in vaccination campaigns, and stimulating prosocial motives to encourage vaccine uptake.

In 2020, research laboratories across the world worked to develop COVID-19 vaccines that would achieve herd immunity and put an end to the pandemic (World Health Organization, 2020). To combat vaccine refusal and optimize social acceptance of the COVID-19 vaccines, it is vital to understand the factors that influence vaccination decisions (Luyten et al., 2019). When designing interventions to increase vaccine uptake, there is an essential need for theory-based implementation for improved outcomes in healthcare settings (Garbutt et al., 2018). In a global health emergency, such as a pandemic, it is useful to identify psychological predictors of vaccination intentions that are common or consistent across countries and cultures.

The present research aims to complement extant theories of health behavior that typically underpin research on vaccine uptakes, such as the Theory of Planned Behavior (TPB; Ajzen, 1991) and the Health Belief Model (HBM; Janz & Becker, 1984). However, the pandemic response may be partly a social phenomenon, in that people may have culturally-motivated reasons to accept vaccination and recent research has shown the need to consider the interplay of individual and cultural factors in promoting preventative health behavior during the pandemic (Leonhardt et al., 2021). Thus, we explore emerging individual- and country-level factors, such as prosocial motives and cultural values that may be commonly involved in the intention to be vaccinated against COVID-19. The analysis will examine common associations across the span of 20 countries, focusing on variables that do not neatly fit into any single, extant framework.

Prosociality and intentions toward vaccination

Prosociality is defined as values and voluntary behaviors aimed to contribute to others' welfare (Batson, 1998; Schwartz, 2010). Previous studies have indicated that considering vaccination as a prosocial act is associated with willingness to get vaccinated (Böhm et al., 2016, 2019). A recent experimental study explained the causal role of prosocial motivation in flu vaccination (Li et al., 2016). Prosociality requires individuals to think in terms of cooperation (Deutsch, 2006) and may take the form of willingness to help others who suffer from coronavirus, to make personal sacrifices to prevent the spread of coronavirus or to support collective action by, for instance, signing petitions on disease control. Prosociality can also be manifested in a subjective sense of solidarity with a broader group. Pandemics in particular require global action and international solidarity (Libal & Kashwan, 2020). The COVID-19 pandemic has presented a global public health emergency and may reveal how deeply people are interconnected and feel a sense of solidarity with individuals in both their own and other countries. Human solidarity is a term defined as social cohesion or a feeling of sympathy shared by individuals within and between groups, which drives supportive action (Wilde, 2013). Vaccination is considered a social contract that provides indirect benefits to the community (Korn et al., 2020) and, therefore, social solidarity plays an important role in reducing public health risk in society during a pandemic (Mishra & Rath, 2020).

Conspiracy theories and vaccine uptake

Individuals may also be motivated to avoid vaccination if they endorse conspiratorial narratives in society. Conspiracy theories (CTs) are responses to psychological needs that originate in crisis situations (Douglas et al., 2017), and typically attribute significant events to the secret acts of malevolent or unlawful forces (Van Prooijen & Douglas, 2017). A recent review of the literature revealed that the likelihood of believing conspiracy theories is associated with psychological, existential, social, and political factors (Douglas et al., 2019). Belief in CTs is associated with mistrust of science (Jolley & Douglas, 2014; Kata, 2010), as well as fear, feelings of being out of control, and uncertainty when people experience societal crisis situations (Van Prooijen & Douglas, 2017). Thus, it is not surprising that conspiracy theories have flourished during the COVID-19 pandemic (Bavel et al., 2020). Some of the conspiracy theories have focused on the origins of the SARS-CoV-2 virus and the role of 5 G technology, while others have focused on prevention and cure, and specifically on vaccination. Anti-vaccine conspiracy theories propose that governments and pharmaceutical companies hide information about vaccine efficacy and safety (Jolley & Douglas, 2014).

These various beliefs are interconnected in a manner that creates a coherent conspiracy theory (Shahsavari et al., 2020) and reflects the conspiracy mentality, a generic tendency to engage in conspiracist ideation (Bruder et al., 2013). A large body of research on the psychology of conspiracy theories prior to the COVID-19 pandemic has pointed to the potential danger of these theories as a significant obstacle to vaccine uptake (Hornsey et al., 2018; Jolley & Douglas, 2014). Recent research has indicated that the content of conspiracy theories is dependent on the country context, generic conspiracy beliefs being more strongly distributed among Jordanian compared to Polish and German respondents (Schlipphak et al., 2021). Given the wide variety of COVID-19 conspiracy theories (Bavel et al., 2020), and their influences within and between groups (Cichocka et al., 2016), in the present research, we examine the general tendency to engage in conspiracy theories.

Overview of the current study

Most of the research regarding predictors of intentions toward COVID-19 vaccination has examined individual-level factors through nationwide surveys. However, countries also differ in their cultures, which may affect individuals' pandemic responses. The aims of the present study were to: (1) explore individual- and country-level determinants of intentions to be vaccinated against COVID-19, and (2) examine international variation in vaccination intentions in 20 countries.

According to the TPB, the intention to engage in a particular behavior is the proximal determinant of behavior. In this research, intentions are used as a dependent variable, as vaccination intentions were found to be both a good predictor and a mediator of interventions' impact on vaccine uptake (Hopfer, 2012).

Individual-level determinants include prosociality factors, generic beliefs in conspiracy theories, variables related to COVID-19, and demographic information. The Health Belief Model contains numerous domains, but we have selected only one main construct that assessed perceived susceptibility to SARS-COV-2 virus infection, as previous studies showed that low perceived susceptibility to virus infection was associated with lower vaccine uptake (Tung et al., 2016). Religion is a multifactorial construct and previous findings concerning the role of religion in vaccination intentions were challenging due to the research taking place in different contexts, countries, and with different aims. Prior research that measured vaccine hesitancy and its determinants worldwide found that religious factors were one of the most frequently cited reasons for vaccine hesitancy (Marti et al., 2017). Given the great variability of religious factors across 20 countries, we measured only if the individual considered themself a religious person or not.

Country-level determinants may also play a role in explaining intentions to be vaccinated, so we included the gross domestic product (GDP) and Hofstede's (2011) cultural value dimensions for each country. The GDP is an indicator of a country's standard of living and high-income countries are defined by the World Bank as countries having a 2019 Gross National income (GNI) per capita of US$12,536 or more. Previous studies have indicated that vaccine hesitancy varies by country income level (Lane et al., 2018). Recently, findings have confirmed that the average willingness to take the COVID-19 vaccine in high-income countries is lower compared to lower-income countries (Arce et al., 2021).

Hofstede's cultural values typically include six dimensions used as a framework for cross-cultural comparisons, but individualism/collectivism and power distance are the cultural values that have the most important implications for social behaviors (Basabe & Ros, 2005). In an individualistic society, people are expected to only take care of themselves, whereas in a collectivist society, people are expected to prioritize the group over individuals (Hofstede, 2011). According to cultural dimensions theory, power distance represents a culture's attitudes toward a hierarchical order (Hofstede et al., 2010). There is mixed evidence regarding the association between individualism/collectivism and vaccination intentions. A previous study showed that prosocially motivated vaccination was more likely in a collectivistic (South Korea) compared to an individualistic country (United States; Böhm et al., 2016). However, collectivism has a negative effect, whereas power distance has a positive effect on influenza vaccination among nurses (Li et al., 2019). Given the contradictory empirical evidence, we explore individualism/collectivism and power distance as country-level determinants of immunization intentions.

Previous studies did not examine the simultaneous role of both individual and country-level factors in determining intentions to be vaccinated. We hypothesized that individual- and country-level factors predict intentions to be vaccinated, considering that models including multimodal predictors may be more useful than those with individual-level predictors only. Specifically, based on previous studies (Böhm et al., 2016, 2019; Marti et al., 2017), we hypothesized that generic beliefs in conspiracy theories and religiosity would be negative predictors, whereas prosociality would be a positive predictor of COVID-19 vaccination intentions. We explored whether country-level individualism/collectivism and power distance dimensions would be significant predictors of COVID-19 vaccination intentions. In addition, we controlled for key socio-demographic variables and GDP to account for their relation to COVID-19 vaccination intentions.

Method

Participants and procedure

This research was part of the international PsyCorona study that examined the psychological impact of the COVID-19 (Project website: https://psycorona.org). Members of the research team translated and distributed the survey in their region of responsibility through a combination of paid procedures, snowball sampling, and social media campaigns. Countries with more than 100 participants who reported their vaccination intention were included in the analysis. Thus, a total of 6697 respondents from 20 countries (Argentina, Australia, Brazil, Canada, Croatia, France, Germany, Greece, Hungary, Italy, Malaysia, Netherlands, Romania, Russia, South Africa, Spain, Turkey, Ukraine, United Kingdom, United States) was included in the current study. Most participants were female (64.2%) between the

ages of 25–54 years (54.8%). The online survey was conducted between 20 March and 20 April 2020 during the initial coronavirus outbreak. The predictors were measured at the end of March and the outcome measure was assessed at a separate time point from the predictors among the same participants, in April. This type of design is justified by the fact that belief in conspiracies is highly stable across time and one study indicated that conspiracy beliefs assessed in March 2020 predicted vaccination intentions in July (Romer & Jamieson, 2020).

The Ethical Committee of the University approved the PsyCorona survey (ecp@rug.nl -study code: PSY-1920-S-0390; irbnyuad@nyu.edu -study code: HRPP-2020-42). Participation was voluntary and informed consent was obtained from all participants. Full survey details and translations are available on the Open Science Framework, https://osf.io/h6yf5/.

Measures

Individual–level variables

Prosociality measures.

Prosocial intent. General prosocial tendencies were assessed with the following three questions adapted to the COVID-19 pandemic (*"I am willing to help others who suffer from coronavirus*," "*I am willing to protect vulnerable groups from coronavirus even at my own expense*," and "*I am willing to make personal sacrifices to prevent the spread of coronavirus*"). Participants responded to each item on a scale from −3 (*strongly disagree*) to 3 (*strongly agree*). The internal consistency was acceptable (Cronbach's α = .77).

Collective action on disease control. Participants were asked whether they wanted to participate in and personally sign public online petitions on COVID-19 disease control. This scale consisted of three items ("*I would sign a petition that supports mandatory vaccination once a vaccine has been developed for coronavirus*," "*I would sign a petition that supports mandatory quarantine for those that have coronavirus and those that have been exposed to the virus*," and "*I would sign a petition that supports reporting people who are suspected to have coronavirus*"). Participants responded on a scale from −3 (*strongly disagree*) to 3 (*strongly agree*). Cronbach's α was .64.

Solidarity toward their own and other countries. Two items assessed solidarity toward their own country ("*I feel a sense of solidarity with people in my country*.") and other countries ("*I feel a sense of solidarity with people in other countries*."); each rated −3 (*strongly disagree*) to 3 (*strongly agree*).

Perceived susceptibility to SARS-COV-2 virus infection. One item assessed perceived susceptibility to SARS-COV-2 virus infection („*How likely is it that the following will happen to you in the next few months? – You will get infected with coronavirus*"). Responses were coded as (1 = *exceptionally unlikely*, 8 = *already happened*).

Generic beliefs in conspiracy theories. The Conspiracy Mentality Questionnaire (CMQ; Bruder et al., 2013) is a 5-item measure of generic conspiracy beliefs in conspiracy theories. Three items from this questionnaire were selected to investigate differences in conspiracy thinking across cultures ("*I think that many very important things happen in the world, which the public is never informed about*," "*I think that politicians usually do not tell us the true motives for their decisions*" and "*I think that government agencies closely monitor all citizens*); each rated on a scale from 0 (*Certainly not*, 0%) to 10 (*Certainly*, 100%). CMQ has demonstrated convergent, discriminant, predictive validity, reliability, and measurement equivalence across cultures (Bruder et al., 2013). The internal consistency was acceptable (Cronbach's α = .73).

Demographic variables. Participants self-reported their age, gender (female, male, other), an education level (7 response options), and religiousness (yes/no).

Variables related to COVID-19. Single-item measures assessed (a) if the person knew someone with COVID-19 (yes/no); (b) if they think that their personal situation will get worse due to economic consequences of coronavirus (1 = *exceptionally unlikely*, 8 = *already happened*); (c) if they had high hopes that the situation regarding the coronavirus would improve (−3 = *Strongly disagree* to 3 = *Strongly agree*), and (d) their subjective level of knowledge about COVID-19 (1 = *not at all knowledgeable* to 5 = *extremely knowledgeable*).

Country-level variables

Country-level variables (the GDP and Hofstede's cultural dimensions) were not included as questions of the survey *per se*. The GDP is an indicator of a country's standard of living that is available from the official World Bank national accounts database (worldbank.org.). Also, Hofstede's cultural dimensions theory has been widely used as a paradigm for research in cross-cultural studies as the national scores afford international comparison between cultures (rating: 1 for *the lowest* to 100 for *the highest*). Country-level indexes were used for our two cultural values of interest, individualism/collectivism, and power distance.

Vaccination intention

The outcome variable, vaccination intention, was measured via a single-item adapted from Logan et al. (2018): "*How likely are you to get vaccinated against coronavirus once a vaccine becomes available?*" on a scale between −2 (*extremely unlikely*) and 2 (*extremely likely*). In conceptual terms, those who respond positively (1 and 2) can be regarded as adherent to COVID-19 vaccination; those who respond negatively (−1 and −2) are non-adherent, and those who responded 0 are undecided.

Statistical analysis

Statistical analyses were performed using SPSS (Version 25). The sample was obtained from a larger database of the project. We used only the data of participants who gave information about their intention to be vaccinated (7953 people). Cases with missing data on the demographic variables and on the one item variables were removed, together with cases with full scales missing (57 cases). We then removed participants from countries that had less than 100 cases of representation because that would have caused extremely unbalanced group sizes. The final sample consisted of 6697 participants. Missing data (0.01%) then were missing completely at random according

to Little's MCAR test, $p > .05$, thus, their replacement with the expectation maximization algorithm was warranted. Possible outliers were not removed.

First, descriptive statistics were conducted, together with analysis of variance to evaluate country differences on intention to be vaccinated. Then, using the restricted likelihood method, we employed multilevel modeling (MLM) analysis to evaluate the influence of different predictors on participants' intention to be vaccinated. Baseline models were compared with full models that assessed both individual-level and country-level variables employing chi-square difference tests (maximum likelihood method). All variables were standardized.

Results

Descriptive statistics

The majority of the participants was female, younger adults (below age 44), had some higher education or a BA degree, and almost half was religious. Most participants (72.2%) did not know anyone with COVID-19. In our study, 3132 participants (46.8%) responded that is "*extremely likely*" that they would get vaccinated, 1745 (26.1%) responded "*likely*," 1126 (16.8%) responded "*undecided*," 392 (4.4%) "*unlikely*," and 402 (6.0%) responded "*extremely unlikely*." For attitudes toward COVID-19 and prosociality-related variables, see, Table 1.

Predictors of intention to be vaccinated

The null model, −2LL = 18920.635, showed that the effect of country was significant, and explained 4.4% of the willingness level of participants to get vaccinated against COVID-19, Wald $Z = 2.80$, $p = .005$, ICC = .044. Thus, we chose a model that incorporated both some individual- and country-level variables. This model was significantly superior to the null model (see, Table 2). Several theoretically-derived variables were significant predictors of participants' intention to be vaccinated (see, Table 2). Generic belief in conspiracy theories was a negative predictor of COVID-19 vaccination intentions. All prosociality-related variables were significant positive predictors – namely, solidarity with both the participant's country and with other countries, pro-social intentions, and collective action on disease control.

As for the COVID-19 related variables, perceived susceptibility to coronavirus infection was positively related to COVID-19 vaccination intentions. There were no reliable associations between vaccination intentions and perceived knowledge about COVID-19, knowing someone diagnosed with COVID-19, fear of personal economic consequences, or hope that the coronavirus situation would soon improve (see, Table 2).

Women (compared to men and other genders) and people with lower levels of education reported lower vaccination intentions. Age was not a significant predictor, $p > .05$. Religiosity was a negative predictor of the intentions to be vaccinated. These results were independent of all country-level variables included in the analysis.

Regarding the international variation in vaccination intentions in those 20 countries included in our study, we found that respondents from the two South American countries, Brasil and Argentina, gave the highest proportion of positive responses (89% and 83%, respectively). Russian respondents gave the lowest proportion of positive responses (54%) (see, Table 3). Overall, 72.9% of participants reported positive intentions to be vaccinated against COVID-19, whereas 16.8% were undecided, and 10.3% reported they would not be vaccinated.

Discussion

Our study showed that the predictors of intentions to be vaccinated against COVID-19 were some of the variables included as individual-level determinants: prosociality factors (solidarity with own country and other countries, prosocial intentions, and collective action on disease control), generic beliefs in conspiracy theories, perceived susceptibility to coronavirus infection, religiosity, gender, and education level.

To the best of our knowledge, this study is among the first to show that prosociality is a positive predictor of the intention to be vaccinated against COVID-19. As the disease produced by the virus is generally severe for certain groups such as older people and those with previous medical issues, people who do not belong to these at-risk groups (particularly younger adults) may feel less willing to adhere to preventive measures such as vaccination (Czeisler et al., 2020). Therefore, vaccination for these people could rely to a great extent on prosociality that mean thinking of others' welfare rather than one's own. Our results indicate that having a sense of solidarity with people from own and other countries, prosocial intentions, and especially collective action to mitigate the virus spread, positively predicted intentions to get vaccinated. Interestingly, these prosocial variables predicted vaccination intentions above other variables such as level of education and knowing someone infected. This is consistent with previous studies indicating that prosociality can increase the willingness to get vaccinated against other viruses such as influenza (Böhm et al., 2016; Li et al., 2016). Overall, our findings support the promotion of prosocial attitudes by international public institutions, to motivate citizens to get vaccinated against COVID-19 (under messages such as "Vaccinate, save others' lives!"). Prior to the COVID-19 pandemic, interventions aimed to promote prosociality increased willingness to be vaccinated against other viruses (Böhm et al., 2016; Li et al., 2016).

In the opposite direction, our results suggest that generic beliefs in conspiracy theories correspond with a lack of vaccination intention – or perhaps outright refusal to be vaccinated. This finding is in line with previous studies indicating that conspiracy beliefs reduce individual's vaccination intentions (Hornsey et al., 2018; Jolley & Douglas, 2014), increase vaccine hesitancy (Shapiro et al., 2018), and facilitate resistance to preventive action generally (Romer & Jamieson, 2020). Moreover, Romer and Jamieson (2020) found that beliefs in a conspiracy related to COVID-19 are stable across time and predict resistance to vaccination. Prior research has considered how a belief in conspiracy theories seems to do more harm than good (Douglas et al., 2019; Van der Linden, 2015). For example, Van der Linden (2015) observed that exposure to conspiracy theories lowered individuals' likelihood to sign a petition to help reduce global warming and to donate to a charity.

Table 1. Individual-level determinants associated with COVID-19 vaccination intention across 20 countries.

Country	Know someone	Intention to be vaccinated		Perceived susceptibility to infection		Personal economic consequences		Hope COVID-19		Knowledge COVID-19		Solidarity with own country		Solidarity with other countries		Prosocial behavior		Collective action on disease control		Conspiracy theories		Religiousness
	yes %	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	yes%
Argentina	11.1	1.27	1.05	3.68	1.27	3.83	1.16	1.12	1.51	3.87	.74	1.55	1.27	1.42	1.29	3.03	3.41	6.38	2.86	22.21	5.61	50.5
Australia	8.1	1.19	1.03	3.09	1.31	3.52	1.25	1.55	1.39	3.69	.85	1.38	1.43	.48	1.38	2.72	3.73	5.11	3.83	20.32	6.50	34.3
Brazil	35.2	1.45	.85	3.57	1.41	4.13	1.08	1.34	1.62	4.11	.72	1.05	1.67	.88	1.55	3.68	3.26	6.12	3.21	23.34	5.59	71.0
Canada	17.7	1.25	1.10	3.60	1.29	3.72	1.13	1.19	1.37	3.84	.76	1.27	1.27	.65	1.41	3.30	3.52	4.63	3.78	18.94	6.23	30.5
Croatia	2 .2	.73	1.26	2.93	1.17	3.99	.92	1.53	1.02	4.11	.54	1.38	1.16	1.38	1.15	1.80	3.79	3.67	3.78	17.60	5.80	28.8
France	35.2	.81	1.27	4.02	1.33	3.36	1.18	.73	1.24	3.96	.73	.74	1.33	.72	1.34	2.35	3.12	1.74	4.55	18.98	6.53	19.7
Germany	16.9	1.15	1.15	3.63	1.29	3.01	1.40	.92	1.45	3.98	.69	1.43	1.21	1.38	1.29	2.89	3.56	3.16	4.28	15.96	7.15	28.8
Greece	15.9	.78	1.19	4.16	1.33	4.32	.88	.83	1.29	4.09	.68	1.18	1.28	1.05	1.31	2.85	3.41	2.97	3.94	20.95	5.77	49.1
Hungary	15.2	.64	1.22	3.91	1.23	4.15	.85	1.60	1.21	3.81	.67	1.05	1.32	1.22	1.32	2.35	3.70	3.06	3.76	19.21	5.93	31.1
Italy	28.4	1.01	1.21	3.29	1.25	4.19	.91	.74	1.40	3.88	.75	1.33	1.32	.95	1.45	2.55	3.44	5.00	3.61	20.40	5.80	54.9
Malaysia	24.8	1.12	.80	3.23	1.16	3.51	1.32	1.65	1.07	3.59	.71	1.38	1.25	.96	1.38	3.37	3.22	6.49	2.52	21.01	4.87	65.6
Netherlands	28.7	.97	1.07	3.83	1.24	3.57	1.04	1.14	1.25	3.80	.73	1.28	1.12	1.02	1.23	3.22	3.24	2.66	4.11	15.08	7.06	28.9
Romania	24.0	.71	1.35	3.28	1.47	4.29	.95	1.64	1.32	3.86	.80	1.00	1.50	1.02	1.49	2.35	3.58	4.96	3.88	22.41	5.31	53.9
Russia	22.2	.48	1.23	3.31	1.29	4.22	1.03	1.53	1.30	3.94	.76	.53	1.53	.53	1.43	.02	3.91	3.32	3.71	20.60	5.22	58.4
South Africa	16.8	.74	1.25	3.43	1.39	4.29	.99	.98	1.40	3.78	.82	1.17	1.42	.75	1.44	2.71	3.80	5.06	3.41	20.68	5.46	76.0
Spain	52.1	1.16	1.05	4.22	1.55	3.73	1.17	1.16	1.39	3.65	.89	1.79	1.13	1.64	1.21	4.15	3.25	4.25	3.70	20.73	6.16	26.0
Turkey	55.4	1.01	.88	3.84	1.52	4.38	.91	.81	1.49	4.06	.87	.84	1.73	.33	1.71	3.12	3.91	6.57	2.50	21.46	5.34	50.3
Ukraine	18.8	.72	1.32	3.37	1.21	3.99	1.12	1.49	1.31	3.97	.75	.21	1.45	.58	1.26	− .43	3.65	4.22	3.60	19.47	5.25	55.7
United Kingdom	24.1	1.21	1.06	3.77	1.19	3.58	1.19	.94	1.41	3.54	.80	.88	1.37	.60	1.40	3.14	3.75	4.12	4.13	19.12	6.19	28.6
United States	27.8	1.17	1.18	3.69	1.37	3.96	1.04	.85	1.56	3.66	.81	.34	1.58	.53	1.45	3.85	3.78	3.10	4.30	20.15	5.82	42.5
Total	27.8	1.03	1.61	3.70	1.38	3.87	1.13	1.07	1.43	3.80	.79	1.03	1.46	.90	1.46	3.04	3.69	3.96	4.06	19.81	6.29	41.6

Know someone = Know someone with COVID-19; Personal economic consequences = belief of having bad personal economic consequences due to COVID-19.

Table 2. Multilevel model predicting intention to be vaccinated (N = 6697).

	Intention to be vaccinated			
	B	*SE*	*t*	*p*
Individual-level variables				
Demographic data				
Gender (reference: female)	.162	.021	7.588	< .001
Age	−.002	.011	− .160	.873
Highest level of education	.097	.010	9.285	< .001
Religiosity (yes/no)	−.137	.021	6.432	< .001
COVID-19-related variables				
Know someone with COVID-19 (yes/no)	.039	.023	1.671	.095
Perceived susceptibility to infection	.120	.011	11.362	< .001
Belief of having bad personal economic consequences due to COVID-19	.000	.010	.015	.988
Hope of COVID-19 pandemic will improve	−.006	.011	− .524	.600
Knowledge about COVID-19	.020	.010	1.946	.052
Prosociality and conspiracy theories				
Solidarity with own country	.036	.014	2.638	.008
Solidarity with other countries	.043	.013	3.250	.001
Prosocial behavior	.071	.011	6.379	< .001
Collective action on disease control	.523	.010	49.803	< .001
Conspiracy theories	−.119	.011	−11.236	< .001
Country-level variables				
GDP per capita	.129	.061	2.108	.058
Power distance	.025	.068	.373	.715
Individualism/collectivism	−.026	.082	− .313	.760
Covariance parameters				
Residual variance	.646	.011	N/A	< .001
Intercept variance	.015	.007	N/A	.013
−2 log likelihood	16230.514	N/A	N/A	N/A
χ^2 (*df*) difference with null model (ML)	2821.387 (21)	N/A	N/A	< .001

Table 3. List of included countries by the percentage of individuals with positive intention to be vaccinated during the initial coronavirus outbreak in 2020.

Country	Survey sample (N = 6697)	Positive intention to be vaccinated (n = 4877)		Undecided (n = 1126)		Negative intention to be vaccinated (n = 694)	
Brazil	193	172	89.11%	12	6.22%	9	4.67%
Argentina	198	164	82.82%	17	8.59%	17	8.59%
United Kingdom	377	296	78.52%	52	13.79%	29	7.69%
Malaysia	125	97	77.60%	27	21.60%	1	0.80%
Spain	766	597	77.94%	106	13.84%	63	8.22%
Canada	266	206	77.44%	42	15.79%	18	6.77%
Australia	172	130	75.58%	32	18,61%	10	5.81%
Germany	302	230	76.16%	46	15.23%	26	8.61%
United States	1362	1039	76.28%	187	13.73%	136	9.99%
Turkey	177	131	74.01%	37	20.90%	9	5.09%
Netherlands	491	359	73.12%	84	17.11%	48	9.77%
Italy	450	326	72.45%	74	16.44%	50	11.11%
France	290	192	66.21%	58	20.00%	40	13.79%
South Africa	250	165	66.00%	49	19.60%	36	14.40%
Ukraine	176	115	65.34%	29	16.48%	32	18.18%
Croatia	104	64	61.54%	25	24.04%	15	14.42%
Greece	391	242	61.89%	99	25.32%	50	12,79%
Romania	254	158	62.20%	50	19.69%	46	18.11%
Hungary	132	75	56.82%	40	30.30%	17	12.88%
Russia	221	119	53.85%	60	27.15%	42	19.00%

The findings of the present study highlight that future interventions to optimize social acceptance of the vaccines against COVID-19 should consider not only countering COVID-19 conspiracy theories specifically but also countering a general conspiracy mentality. However, given that misinformation tends to be resistant to correction (Lewandowsky et al., 2012), future attempts to combat the culture of conspiracism could, for instance, consider systems that can monitor the emergence of conspiracy theories on social media (Shahsavari et al., 2020). These theories spread on social media platforms may therefore undermine prosocial intentions and efforts to end the coronavirus pandemic.

Another negative predictor of intentions to be vaccinated was religiosity, supporting results of the previous research (Marti et al., 2017). Religious and conspiracy beliefs complement and contradict one another (Wood & Douglas, 2019) and both of them may be related to judgments of the world as a fundamentally unjust or just place (Rubin & Peplau, 1975). Moreover, recent studies have shown that mean levels of generic conspiracy beliefs were higher in more religious countries (Schlipphak et al., 2021). Previous studies have shown that explicit religious objections against vaccines refer to concern about the way they are manufactured (Pelčić et al., 2016), the fear of side effects, and that vaccine acceptance would interfere with divine providence (Ruijs et al., 2012).

With regards to demographic factors, women were less willing to get vaccinated than men and this finding is consistent with prior studies (Eastwood et al., 2010). Higher education was associated with higher levels of vaccine willingness highlighting that education may be associated with better health outcomes (MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015).

Country-level determinants, such as GDP and cultural values, were not significant predictors of COVID-19 vaccination intentions. Although cultural background might play an important role in the relationship between prosociality and vaccination (Böhm et al., 2016), the present study suggests this may not be accounted for via relative country-level differences on the dimensions (Hofstede, 2011).

This study has several limitations. First, although the outcome measure was assessed at a separate time point from the predictors, such a design does not afford causal inferences. Nevertheless, experimental studies have shown a causal relationship between beliefs in conspiracy theories and vaccination intentions, mediated by the perceived dangers of vaccines, mistrust in authorities, and feelings of powerlessness (Jolley & Douglas, 2014). Second, the acceptance rate of COVID-19 vaccination may differ from self-reported vaccination intentions observed in the present data as intentions are distinct from behavior (Sheeran, 2002). According to the theory of reasoned action, individuals "intend to perform a behavior when they evaluate it positively and when they believe that important others think they should perform it" (Ajzen & Fishbein, 1980, p. 6). Despite these limitations, a key strength of the current study is its size and international scope, having taken place across 20 countries. This suggests that the significant predictors may be common across cultures and contexts similar to those examined here. Nevertheless, future studies should investigate the mechanisms that lead to different forms of prosocial behavior across countries.

Conclusion

By evaluating theoretical predictors of intentions to be vaccinated against COVID-19, these findings help to shed light on potentially common origins of vaccine refusal in countries

around the globe. The study suggests that prosociality, generic beliefs in conspiracy theories, and religiosity are common predictors of COVID-19 vaccination intentions. Our results can inform the selection of interventions to address COVID-19 vaccine uptake and have implications for international programs advanced by governmental as well as non-governmental organizations, such as WHO regional offices and UNICEF. Findings gave an important indication of how people intend to engage with the vaccines when the possibility of a vaccine was hypothetical and in the absence of any other contaminating information about them (e.g., side-effects, efficacy rates). Our results showed a wide variation between countries in willingness to accept a COVID-19 vaccine which could delay global control of the pandemic (Lazarus et al., 2021). Countries will develop their own, idiosyncratic, vaccination strategies and interventions, leading to further variation. The contribution of religiosity as a negative factor, influencing decisions around vaccination, may be changed by engaging religious leaders as trusted messengers of prosocial motives for vaccination (Privor-Dumm & King, 2020). Active hesitancy prevention may include public health campaigns to build prosociality by collective action and to combat conspiracy theories that undermine vaccination programs worldwide.

Disclosure statement

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Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Data reuse disclosure statement

The theoretically derived tests of our prosociality predictors on vaccination intentions are unique to this report. However, the prosociality variables have previously been published in tests of other research questions – namely, longitudinal effects of solidarity on social contact (van Breen et al, 2021), and effects of various demographic and social psychological variables, treating prosocial intentions as a dependent variable (Han et al., 2021; Jin et al., 2021; Lemay et al, 2021; Resta et al., 2021; Romano et al., 2021). No prior publication has examined conspiracy beliefs or the vaccination intentions. A repository of PsyCorona publications can be found here https://psycorona.org/results/

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