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Justice Beliefs and Cultural Values Predict Support for COVID-19 Vaccination and Quarantine Behavioral Mandates

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Supplementary Material

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Ethics Information

This study was approved by the Ethics Committees of the University of Groningen (PSY-1920-S-0390) and New York University Abu Dhabi (HRPP-2020-42)

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Data source and participants

This study was performed using data collected by the PsyCorona survey. Subsequent descriptions of this data source are largely identical to previous descriptions [1,2] PsyCorona is an ad hoc, multinational collaborative study in response to the COVID-19 pandemic. PsyCorona seeks to study the psychological factors that predict how people respond to the coronavirus and to associated public health measures. The ultimate goal is to provide actionable knowledge that can serve to enhance pandemic response. The present use of PsyCorona data was undertaken in parallel to many alternate considerations of the available data. Therefore, subsequent description of our participant sample, as well as procedures for recruiting participants are largely identical to other descriptions of the PsyCorona, excepting small changes due to unique features of the present undertaking.

Worldwide 62,142 respondents completed the PsyCorona survey between March 19 and May 25, 2020. The survey was distributed online through a combination of convenience

sampling, snowball sampling and paid procedures. Members of the research team, in their respective countries, distributed the survey via different means: social media campaigns, academic networks, and press releases, among others. Upon completing the survey and being debriefed, a final screen invited respondents to distribute the survey link to their networks. Paid procedures supplemented the data collection. Qualtrics Panels were used to incentivize approximately 1000 additional respondents in 23 countries: Argentina, Australia, Brazil, Canada, France, Germany, Greece, Indonesia, Italy, Japan, Netherlands, Philippines, Romania, Russia, Saudi Arabia, Serbia, South Africa, South Korea, Spain, Turkey, Ukraine, United Kingdom, and the United States. The paid samples were representative of the country's population in terms of age and gender in nineteen countries, and by gender in four countries (due to insufficient access to the 55+ age group in Greece, Indonesia, Saudi Arabia, and Ukraine). In China, the panel service WJX supplemented the Chinese sample ($n = 1000$, representative by age and geography, but higher average education). In the United States, Amazon's MTurk supplemented the United States sample ($n = 5500$). The present analysis used wave 6 of the Psycorona survey, which was administered in all countries on May 9th, 2020. Due to requirements of multilevel modeling, countries with less than 5 wave 6 participants were eliminated from the present consideration. This resulted in a final effective sample size of 6424 participants across 46 countries. Table S1 provides summarizes overall sociodemographic characteristics of participants. Table S2 provides within-country samples sizes.

Translation process

The survey was written in English and translated into 30 languages by bilingual speakers who were members of the research team. For more information on the PsyCorona Scale Translation Procedure, consult supplementary materials.

Covariates/Control variables

Participants reported *gender* (0 = male, 1 = female), and indicated *age* in categories from “18 to 24”, then in decade groups (i.e., “25 – 34”, “35 – 44”, etc.) through “85 +”. Participants reported highest level of *education* categorically from (1) primary education through (7) PhD Degree. Age and education were included as continuous covariates our model. To assess experiences with having the coronavirus, participants responded to the item “Do you personally know anyone who currently has coronavirus?” separately for themselves, family members, a close friend, someone I know, and someone else. The sum of affirmative responses was taken as an indicator of *Coronavirus Experience* (Table S1).

Data Analysis

Stepwise multilevel models fit with the nlme package in R v3.6.2 were used to examine substantive hypotheses separately for each outcome [3]. Multilevel models are appropriate in that they account for within-country dependence in outcomes (i.e., intraclass correlations: ICC), and allow for between-country variation (random effects) in parameters representing person-level/within-country effects (fixed effects). At the first model step, we included fixed effects for person-level JWB main effects and covariates, and random effects for the model intercept and the JWB slopes. Given between country variation, JWB constructs, education and age were group-mean centered for the regression. At the second model step, we introduced country-level main effects and associated cross-level interactions with each JWB predictor. We used likelihood ratio tests (i.e., difference between $-2 * \log$ likelihoods of nested models; distributed as χ^2) to

examine whether model fit improved upon addition of country-level predictors and interactions at step 2. Consistent with recommendations [4], we group mean centered individual-level variables. Likewise, country-level predictors were grand mean centered and rescaled (divided by 10) for the regression. Although available literature supports that small level 2 sample sizes have negligible effects on multilevel modeling estimates [5], we nonetheless opted to conservatively estimate multilevel relationships by excluding countries with fewer than n=5 observations.

Significant interactions were probed with methods described by Preacher, Curran & Bauer using related online resources [6,7]. A hierarchical representation of the final model, wherein *i* indexes person-level variation and *j* indexes country-level variation, is described below:

Within-Country (Level 1):

$$Y_{ij} = \beta_{0j} + \beta_{1j} * \text{JWB-Self}_{ij} + \beta_{2j} * \text{JWB-Other}_{ij} + \beta_{3j} * \text{Age}_{ij} + \beta_{4j} * \text{Education}_{ij} + \beta_{5j} * \text{Female}_{ij} + \beta_{6j} * \text{Coronavirus Experience}_{ij} + r_{ij}$$

Between-Country (Level 2):

$$\beta_{0j} = \gamma_{00} + \gamma_{01} * \text{Power Distance}_j + \gamma_{02} * \text{Individualism}_j + \gamma_{03} * \text{Masculinity}_j + \gamma_{04} * \text{Uncertainty Avoidance}_j + \gamma_{05} * \text{Long Term Orientation}_j + \gamma_{06} * \text{Indulgence}_j + r_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} * \text{Power Distance}_j + \gamma_{12} * \text{Individualism}_j + \gamma_{13} * \text{Masculinity}_j + \gamma_{14} * \text{Uncertainty Avoidance}_j + \gamma_{15} * \text{Long Term Orientation}_j + \gamma_{16} * \text{Indulgence}_j + r_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21} * \text{Power Distance}_j + \gamma_{22} * \text{Individualism}_j + \gamma_{23} * \text{Masculinity}_j + \gamma_{24} * \text{Uncertainty Avoidance}_j + \gamma_{25} * \text{Long Term Orientation}_j + \gamma_{26} * \text{Indulgence}_j + r_{2j}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

$$\beta_{5j} = \gamma_{50}$$

$$\beta_{6j} = \gamma_{60}$$

Table S1

Total Sample Sociodemographics (N = 6424)

	N	Percent
Age Group		
18-24	720	11.2
25-34	1118	17.4
35-44	1131	17.6
45-54	1181	18.4
55-64	1190	18.5
65-75	940	14.6
75-85	135	2.1
85+	9	0.1
Gender		
Male	2234	34.8
Female	4190	65.2
Education		
Primary education	54	0.8
General secondary education	771	12.0
Vocational education	755	11.8
Higher education	1292	20.1
Bachelors degree	1775	27.6
Masters degree	1320	20.5
PhD degree	457	7.1
Coronavirus Exposure		
None	4965	77.3
Self	1238	19.3
Family Member	158	2.5
Close Friend	46	0.7
Someone I Know	15	0.2
Someone Else	2	0.0

Table S2

Country-level Sample Sizes and Mean Cultural Dimensions (N = 46)

	N	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-Term Orientation	Indulgence
Algeria	6	83.00	18.00	20.00	60.00	15.00	83.00
Argentina	149	49.00	46.00	56.00	86.00	20.00	62.00
Australia	157	38.00	90.00	61.00	51.00	21.00	71.00
Austria	10	11.00	55.00	79.00	70.00	60.00	63.00
Bangladesh	7	80.00	20.00	55.00	60.00	47.00	20.00
Belgium	8	65.00	75.00	54.00	94.00	82.00	57.00
Brazil	148	69.00	38.00	49.00	76.00	44.00	59.00
Canada	210	39.00	80.00	52.00	48.00	36.00	68.00
Chile	52	63.00	23.00	28.00	86.00	31.00	68.00
Croatia	76	73.00	33.00	40.00	80.00	58.00	33.00
Czech Republic	6	57.00	58.00	57.00	74.00	70.00	29.00
France	263	68.00	71.00	43.00	86.00	63.00	48.00
Germany	282	35.00	67.00	66.00	65.00	83.00	40.00
Greece	419	60.00	35.00	57.00	100.00	45.00	50.00
Hong Kong S.A.R.	10	68.00	25.00	57.00	29.00	61.00	17.00
Hungary	84	46.00	80.00	88.00	82.00	58.00	31.00
India	6	77.00	48.00	56.00	40.00	51.00	26.00
Indonesia	111	78.00	14.00	46.00	48.00	62.00	38.00
Ireland	6	28.00	70.00	68.00	35.00	24.00	65.00
Italy	342	50.00	76.00	70.00	75.00	61.00	30.00
Japan	62	54.00	46.00	95.00	92.00	88.00	42.00
Kazakhstan	20	88.00	20.00	50.00	88.00	85.00	22.00
Luxembourg	7	40.00	60.00	50.00	70.00	64.00	56.00
Malaysia	79	100.00	26.00	50.00	36.00	41.00	57.00
Mexico	6	81.00	30.00	69.00	82.00	24.00	97.00
Netherlands	523	38.00	80.00	14.00	53.00	67.00	68.00
Pakistan	6	55.00	14.00	50.00	70.00	50.00	0.00
Philippines	73	94.00	32.00	64.00	44.00	27.00	42.00
Poland	91	68.00	60.00	64.00	93.00	38.00	29.00
Republic of Serbia	288	86.00	25.00	43.00	92.00	52.00	28.00
Romania	217	90.00	30.00	42.00	90.00	52.00	20.00
Russia	106	93.00	39.00	36.00	95.00	81.00	20.00
Saudi Arabia	70	95.00	25.00	60.00	80.00	36.00	52.00
Singapore	36	74.00	20.00	48.00	8.00	72.00	46.00
South Africa	155	49.00	65.00	63.00	49.00	34.00	63.00
South Korea	17	60.00	18.00	39.00	85.00	100.00	29.00
Spain	661	57.00	51.00	42.00	86.00	48.00	44.00
Sweden	9	31.00	71.00	5.00	29.00	53.00	78.00
Switzerland	12	34.00	68.00	70.00	58.00	74.00	66.00
Taiwan	14	58.00	17.00	45.00	69.00	93.00	49.00
Thailand	10	64.00	20.00	34.00	64.00	32.00	45.00
Turkey	106	66.00	37.00	45.00	85.00	46.00	49.00
Ukraine	151	92.00	25.00	27.00	95.00	86.00	14.00
United Kingdom	377	35.00	89.00	66.00	35.00	51.00	69.00
United States	954	40.00	91.00	62.00	46.00	26.00	68.00
Vietnam	22	70.00	20.00	40.00	30.00	57.00	35.00

Table S3

Means, Standard Deviations and Correlations for Individual and Country-level Measures.

Individual-Level						
	Mean	SD	1.	2.	3.	
1. Mandatory Vaccination	0.99	2.01	--			
2. Mandatory Quarantine	1.83	1.44	.50**	--		
3. JWB-Self	0.45	0.86	.07**	.06**	--	
4. JWB-Other	-0.20	0.88	.04**	0.01	.48**	

Country-Level							
	Mean	SD	1.	2.	3.	4.	5.
1. Power Distance	61.93	21.14	--				
2. Individualism	45.67	24.26	-.69**	--			
3. Masculinity	51.63	17.43	-.26	.31*	--		
4. Uncertainty Avoidance	66.72	22.86	.22	-.13	.05	--	
5. Long-Term Orientation	53.67	21.41	.01	-.10	-.02	.22	--
6. Indulgence	46.65	20.72	-.40**	.40**	-.03	-.25	-.47**

Notes: JWB = Just World Beliefs. * $p < .05$, ** $p < .01$, *** $p < .001$.

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