

Intellectual humility predicts COVID-19 preventive practices through greater adoption of data-driven information and feelings of responsibility

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Abstract

Preventive health practices have been crucial to mitigating viral spread during the COVID-19 pandemic. In two studies, we examined whether intellectual humility—openness to one's existing knowledge being inaccurate—related to greater engagement in preventive health practices (social distancing, handwashing, mask-wearing). In Study 1, we found that intellectually humble people were more likely to engage in COVID-19 preventive practices. Additionally, this link was driven by intellectually humble people's tendency to adopt information from data-driven sources (e.g., medical experts) and greater feelings of responsibility over the outcomes of COVID-19. In Study 2, we found support for these relationships over time (2 weeks). Additionally, Study 2 showed that the link between intellectual humility and preventive practices was driven by a greater tendency to adopt data-driven information when encountering it, rather than actively seeking out such information. These findings reveal the promising role of intellectual humility in making well-informed decisions during public health crises.

KEYWORDS

adoption of data-driven information, COVID-19, feeling of responsibility, handwashing/disinfecting, intellectual humility, mask-wearing, preventive practices, social distancing

1 | INTRODUCTION

During crises, people's adoption of novel information and behaviors is crucial for survival. For instance, during the COVID-19 pandemic, embracing then unfamiliar practices (e.g., social distancing) reduced infection risk and community spread (Kwon et al., 2021; Price & van Holm, 2021). Given the importance of these epidemiological outcomes, researchers rushed to identify factors promoting the adoption of preventive health practices. For instance, they found that women social distanced more than men (Olcaysoy Okten et al., 2020), that boredom proneness and low self-control impaired distancing (Martarelli et al., 2021), and that political conservatism predicted reduced distancing (Allcott et al., 2020).¹ Here, we extend this literature to a more cognitive individual-difference approach by examining whether intellectual humility (IH)—one's openness to accepting that one's beliefs might be wrong (Leary et al., 2017)—fostered preventive COVID-19 behaviors during the pandemic. We propose that IH may be associated with these behaviors by promoting people's adoption of data-driven information and feelings of personal responsibility regarding their behaviors and the outcomes of COVID-19.

1.1 | IH and adoption of data-driven information

During the pandemic, intellectual humility may have facilitated preventive health behaviors (e.g., mask-wearing) by promoting a data-driven approach to a flood of conflicting information (e.g., divergent political messaging on the dangers of the virus, varying local policies; Cheng et al., 2020; Hart et al., 2020; Nagler et al., 2020). Previous research demonstrates that intellectually humble people navigate conflicting information better by engaging in active inspection and by paying greater attention to the credibility of information sources (Koetke et al., 2022). For instance, those with high (vs. low) IH are better able to update their knowledge in accordance with new information when it is provided by reliable sources (Krumrei-Mancuso & Rouse, 2016; Porter & Schumann, 2018).² Intellectual humility should thus predict a greater adoption of data-driven information in the midst of an info- and pan-demic, which in turn should predict greater preventive COVID-19 behaviors (e.g., wearing a mask).

1.2 | IH and felt responsibility

Public health issues, such as a pandemic, call for civic engagement working together towards the public good (Nihlén Fahlquist, 2019). IH relates to taking responsibility for others and oneself beyond one's own immediate interests (Whitcomb et al., 2017). These selfless attitudes are evidenced by IH's strong relationship with empathy and altruism (Krumrei-Mancuso, 2017; Tangney, 2000), which were especially critical in terms of adopting preventive practices during COVID-19 (e.g., Gualda, 2022; Hellmann et al., 2021). Therefore, we predicted that people high in IH engage more in COVID-19 preventive practices in part because they weigh feelings of responsibility over immediate personal gratification (e.g., socializing with friends; not wearing a mask in public).

1.3 | The present research

The goal of the present research is to investigate whether intellectual humility predicted greater preventive COVID-19 behaviors, such as social distancing, mask-wearing, and maintaining hygiene. Additionally, we examined two potential mechanisms via which IH may translate into these preventative health behaviors: (1) adopting pandemic-related information from data-driven sources, and (2) feelings of responsibility for protecting other members of society and oneself beyond one's immediate personal interests.

2 | STUDY 1: IH AND PREVENTIVE COVID-19 BEHAVIORS—A MEDIATION MODEL

2.1 | Method

2.1.1 | Participants

The study was preregistered [here](#). A sample size of 264 was required to detect a small effect ($f^2 = 0.03$) with 80% power. We invited 300 participants via Prolific Academic (U.S.) early in the pandemic (10 July 2020). Among 303 responses, 26 were excluded (22 for failing an attention check, and four due to missing data), leaving 277 participants (135 Female; $M_{\text{age}} = 34.10$, $SD_{\text{age}} = 11.92$).

2.1.2 | Measurements

For all measures, see [here](#).

Intellectual humility. IH was measured through the 6-item General Intellectual Humility Scale (GIHS; Leary et al., 2017) (e.g., “I accept that my beliefs and attitudes may be wrong”; $\alpha = 0.82$) (1: *Not at all*, 7: *Very much*).

COVID-19 preventive practices

Social distancing. We included scales developed by Wu and Huber (2021); 3 items, for example, “I am practicing social distancing”; 1: *Strongly disagree*, 7: *Strongly agree*; ($\alpha = 0.58$), Jordan et al. (2021); 8 items, for example, “[To what extent do you avoid] socializing in small gatherings”; 0: *I make no effort to avoid this activity*, 100: *I completely avoid this activity*; ($\alpha = 0.82$), and Gollwitzer et al. (2020); 6 items, e.g., “I stay at home as much as possible”; 1: *Not at all true*, 7: *Very true*, ($\alpha = 0.86$). We standardized and averaged across these measures, $\alpha = 0.90$.

Handwashing/disinfecting. Five items were adopted from Gollwitzer et al. (2020; e.g., “When I can, I wash my hands for at least 10 s or more,” 1: *Not at all true*, 7: *Very true*), $\alpha = 0.80$.

Mask-wearing. Mask-wearing was measured via an item from Gollwitzer et al. (2020) (“I make sure to wear a mask when leaving my house”; 1: *Not at all true*, 7: *Very true*) and one further item (“After the start of the COVID-19 pandemic, you _____ wear a mask when you go outside”; 1: *Never*, 7: *Very frequently*), $\alpha = 0.85$.

Adoption of data-driven information sources. We assessed the adoption of data-driven information sources by having participants rate the extent to which their preventive COVID practices were driven by three data-driven sources: medical experts' suggestions, other countries' experiences, and their own health history (1: *Not at all*, 7: *Very much*; Olcaysoy Okten et al., 2020).

Felt responsibility. We asked participants to what extent their feelings of responsibility drove their engagement in preventive practices (two items; “your feelings of responsibility for yourself” and “your feelings of responsibility for others”; 1: *Not at all*, 7: *Very much*; Olcaysoy Okten et al., 2020). See SM for other sources measured exploratorily.

Control variables. We included five control variables: (1) self-reported frequency of mask-wearing before the pandemic (1: *Never*, 7: *Very frequently*), (2) days participants left their house for work last week (0–7 days), (3) social desirability (as preventive practices were self-reported) (Reynolds, 1982), (4) infection rates in the state in which each participant was residing on the date of data collection, and (5) political ideology (1: *Very liberal*, 7: *Very conservative*).

2.2 | Results

2.2.1 | Correlational analyses

IH positively predicted the three assessed preventive health measures—social distancing, handwashing/disinfecting, and mask-wearing ($ps < 0.05$; Table 1). These correlations remained when accounting for the five control variables.

TABLE 1 Correlation between IH and preventive health practices (Study 1).

	Social distancing		Handwashing/disinfecting		Mask-wearing	
	Bivariate	Partial ^a	Bivariate	Partial ^a	Bivariate	Partial ^a
IH Coefficients	0.215	0.224	0.278	0.244	0.139	0.128
BCa 95% CI ^b	[0.099, 0.338]	[0.093, 0.338]	[0.150, 0.404]	[0.101, 0.377]	[0.017, 0.267]	[-0.002, 0.254]
<i>p</i> -value	<0.001	<0.001	<0.001	<0.001	0.021	0.034

Abbreviation: IH, intellectual humility.

^aControlled for mask-wearing before COVID-19, leaving-for-work days, state infection cases, social desirability, and political conservatism.

^bBias-corrected and accelerated (BCa) 95% CI results are based on 1000 bootstrap samples.

TABLE 2 Correlation between IH and information sources (Study 1).

	IH	
	Bivariate	Partial ^a
Adoption of data-driven information		
Medical experts	0.209*** [0.073, 0.358]	0.225*** [0.091, 0.368]
Other countries	0.215*** [0.093, 0.346]	0.184** [0.058, 0.306]
Health history	0.248*** [0.133, 0.366]	0.191** [0.068, 0.319]
Felt responsibility		
Responsibility for others	0.303*** [0.157, 0.442]	0.312*** [0.177, 0.442]
Responsibility for oneself	0.292*** [0.156, 0.415]	0.279*** [0.154, 0.404]

Note: BCa 95% CI results based on 1000 bootstrap samples are in brackets.

Abbreviation: IH, intellectual humility.

^aControlled for mask-wearing before COVID-19, leaving-for-work days, social desirability, state infection cases, and political conservatism.

** $p < 0.01$, *** $p < 0.001$.

Additionally, as hypothesized, IH predicted greater adoption of information from data-driven sources (e.g., medical experts) and greater felt responsibility regarding COVID-19 health outcomes (i.e., responsibility for others' and one's own health), $p_s < 0.001$ (Table 2).

2.2.2 | Mediation analyses

To investigate whether adopting data-driven information mediated the link between IH and preventive practices, we conducted path models (pre-registered as exploratory; 5000 bootstrapped samples) using structural equation modeling (SEM) (Figure 1). We entered IH, adoption of data-driven information, and preventive health practices as latent variables represented by the items measuring each variable. The model exhibited appropriate fit (SRMR = 0.05, RMSEA = 0.05, CFI = 0.96; see SM) and indicated a mediation ($\beta = 0.34$, $p = 0.005$); IH positively predicted adopting data-driven information ($\beta = 0.38$, $p < 0.001$), which in turn predicted greater preventive health practices ($\beta = 0.90$, $p < 0.001$).

The same procedure was applied to test felt responsibility as a mediator (Figure 2). The model exhibited good fit (SRMR = 0.04, RMSEA = 0.04, CFI = 0.98), and indicated a mediation ($\beta = 0.50$, $p = 0.002$): IH positively predicted feelings of responsibility ($\beta = 0.50$, $p < 0.001$), which in turn predicted greater preventive health practices ($\beta = 1.00$, $p < 0.001$). These results remained when including the control variables (see SM).

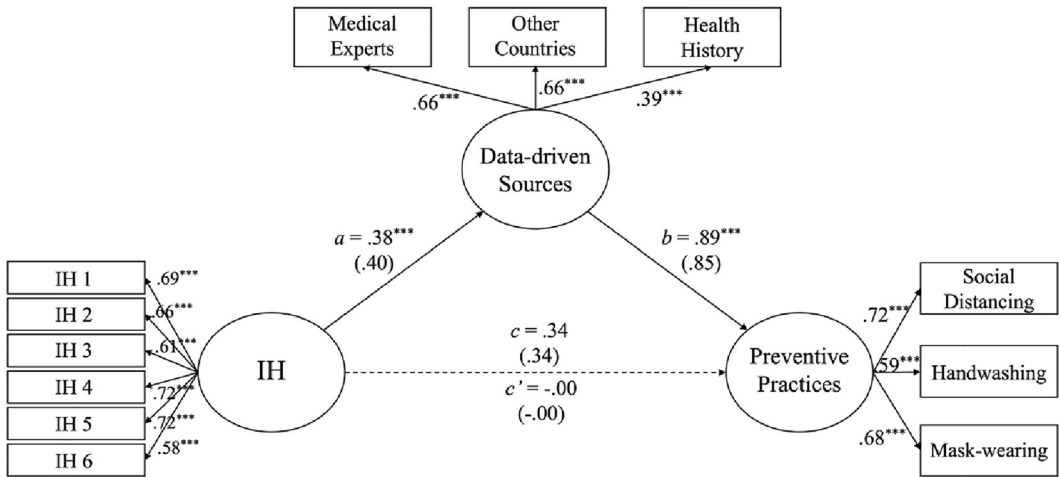


FIGURE 1 Mediation Model of IH, Adoption of Data-Driven Sources, and Preventive Practices (Study 1). Unstandardized coefficients are in parentheses. *** $p < 0.001$.

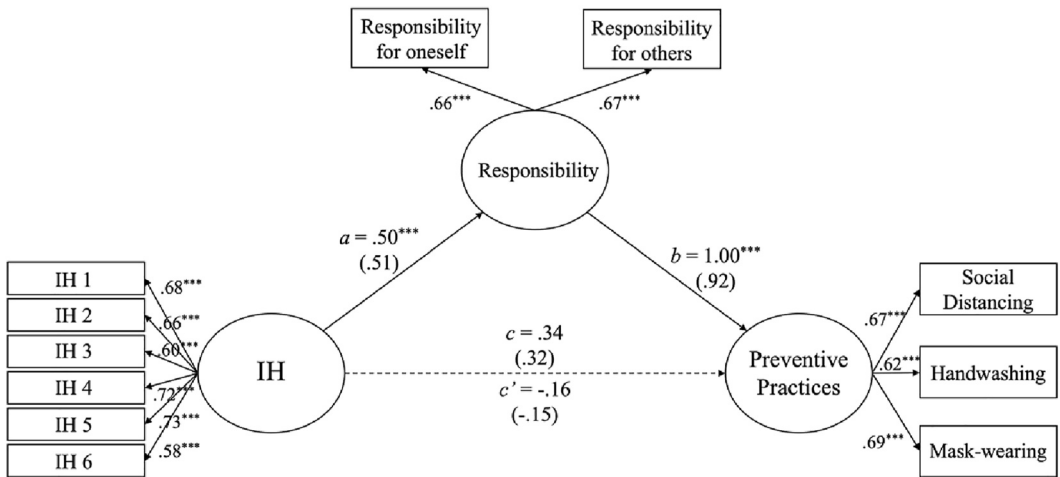


FIGURE 2 Mediation Model of IH, Felt Responsibility, and Preventive Health Practices (Study 1). Unstandardized coefficients are in parentheses. *** $p < 0.001$.

The fit for a model including both adoption of data-driven information and felt responsibility as mediators showed poor model fit (SRMR = 0.09, RMSEA = 0.09, CFI = 0.86). These analyses are reported in SM.

3 | STUDY 2: MEDIATION MODELS ACROSS TWO TIME POINTS

In Study 2, we tested the observed links across time during a period of potential COVID-19 surge—the winter holiday season. Additionally, Study 1 left unclear whether IH predicts greater preventive COVID-19 behaviors due to seeking out data-driven information (information-seeking) or adopting reliable information when this information is encountered (information-adoption). Furthermore, if IH does predict greater adoption of data-driven information, is this due to the perceived credibility of the contents of such information or because of the credibility of the messenger? (See SM for a detailed explanation). To address these questions, in Study 2, we tested participants' tendency to seek versus adopt data-driven COVID-19 information when this information came from medical versus non-medical experts.

3.1 | Method

3.1.1 | Participants

Time 1 (T1). See Study 1 for power analysis. We invited 300 participants via Prolific Academic at the start of the winter holiday season (12/23/2020). Of 299 participants, nine were excluded for attention failures (183 female; $M_{\text{age}} = 31.49$, $SD_{\text{age}} = 11.38$).

Time 2 (T1). The follow-up survey was distributed after the winter holiday season (1/05/2021-1/18/2021). Two hundred and fifty-two participants responded (two excluded for missing Prolific IDs; 154 females; $M_{\text{age}} = 31.96$, $SD_{\text{age}} = 11.46$).

3.1.2 | Measurements

Intellectual humility (T1). Same as Study 1.

Seeking data-driven information (T1). Participants reviewed two lists of COVID-19 information supposedly stemming from medical experts and from lay individuals (within-participants, with randomized order; Figures 3 and 4; SM for details). These pieces of information were adapted from credible news articles covering COVID-19 (e.g., symptoms of COVID-19, infection and death rates). Participants could click on as many pieces of information as they liked (0–8 possibilities per list). We recorded the number of information pieces participants selected among the available options in each list (see Porter & Schumann, 2018; for response times see SM).

Adoption of data-driven information (T1). Additionally to *seeking* data-driven information, a four-item scale assessed participants' *adoption* of data-driven information. Participants rated how believable, convincing, and important the COVID-19 information they read was and indicated how much they agreed with the information they had read (1: *Not at all*, 7: *Completely*; $\alpha = 0.92$; collapsed across experts' and non-experts' information). An option of "NA/I didn't read anything" was also provided; these participants ($n = 55$) were not included in this analysis (see SM).

COVID-19 felt responsibility (T1). To conceptually replicate Study 1, we assessed felt responsibility within the COVID-19 context via an adapted three-item scale from the Experienced Responsibility for Work Outcomes Scale (Hackman & Oldham, 1975; e.g., "I feel personally responsible for my decisions about social distancing next week"; 1: *Not at all*, 7: *Very much*; $\alpha = 0.87$).

COVID-19 preventive practices (T2). Social distancing practices were measured at Time 2—approximately 2–3 weeks later.

Imagine that you are trying to make a decision about whether or not, and if so, how much you should socially (physically) distance during Holiday week.

We would like to give you a chance to hear about some messages from **medical experts** on the current condition of the pandemic and the requirement of social distancing. Each expert provides a unique, brief, and easy to read message related to the current situation of COVID-19. Please review this list and read as many messages as you wish.

You may choose to review as many opinions as you wish. You can also decide anytime to skip and proceed to the next step.

FIGURE 3 Instruction for Seeking Information from Medical Experts (Study 2). For information from non-medical experts, all the instructions remained the same except that the bolded and underlined "medical experts" was substituted with "lay people".

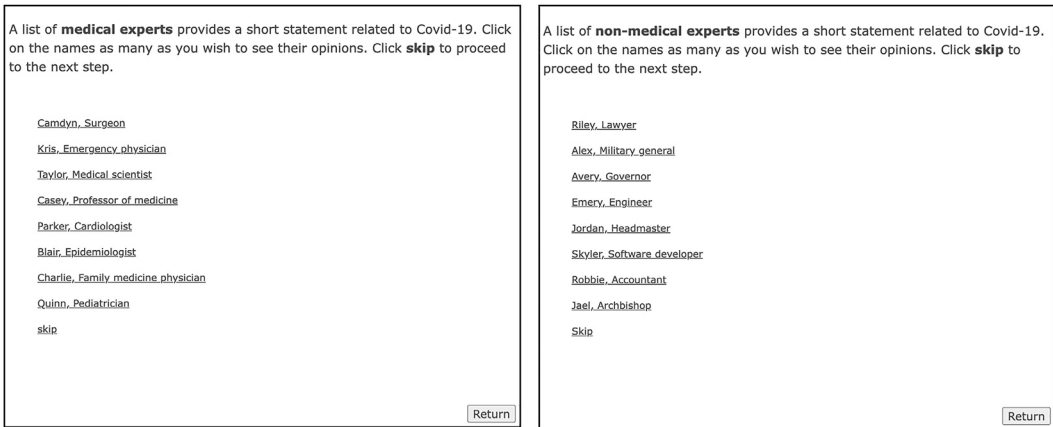


FIGURE 4 Examples of Lists for Seeking Information from Medical (Left) and Non-Medical (Right) Experts (Study 2). Eight list versions consisted of counterbalanced orders of names, occupations, and expertise types. Participants were randomly provided with one version (see SM).

Social distancing. Social distancing was assessed via Gollwitzer et al. (2020), which showed the highest reliability among the scales in Study 1. We adapted the instructions to the winter holiday (“How true are the following statements with regard to how you have been responding to the COVID-19 pandemic during the recent holiday?”) ($\alpha = 0.89$).

Traveling. One question assessed traveling behavior; “Have you traveled for the recent holiday?” (0: yes, 1: no).

Inviting guests. One item assessed whether participants invited guests for the holiday; “Have you invited people to your house for the recent holiday?” (0: yes; 1: no).

Handwashing/disinfecting. Handwashing/disinfecting was measured as in Study 1 ($\alpha = 0.80$).

Mask-wearing. Mask-wearing was measured as in Study 1 ($\alpha = 0.77$).

Control variables (T1). Social desirability ($\alpha = 0.70$) and political conservatism were measured as controls (assessed as in Study 1).

3.2 | Results

3.2.1 | Preventive health behaviors

Replicating Study 1, IH (measured at Time 1) positively predicted social distancing ($r = 0.15, p = 0.03$), handwashing/disinfecting ($r = 0.24, p < 0.001$), and mask-wearing ($r = 0.22, p = 0.005$) (all measured at Time 2—approximately 2–3 weeks later Table 3). Handwashing/disinfecting remained significant after accounting for the control variables (social desirability and political conservatism; $r = 0.19, p = 0.006$), though social distancing ($r = 0.07, p = 0.34$) and mask-wearing ($r = 0.12, p = 0.12$) did not.

For the two categorical preventive practices measures—traveling and inviting guests—*t*-tests did not reveal group differences in IH ($t_{\text{travel}}(209) = -1.17, p = 0.24$; $t_{\text{invite}}(211) = 0.442, p = 0.66$). This may be because both travel/invite behaviors were measured by a single item, and a small percentage of participants reported traveling (12.4%) or inviting guests (20.3%), providing little variance.

3.2.2 | Seeking data-driven information versus adoption of data-driven information

We did not find a robust relationship between IH and seeking data-driven information. IH neither predicted the number of COVID-19 information pieces participants clicked on written by experts ($r_{\text{IH-medical experts}} = 0.11, p = 0.06$) nor written by non-experts ($r_{\text{IH-non-medical experts}} = 0.09, p = 0.14$).

TABLE 3 Correlations between key variables (Study 2).

	1	2	3	4	5	6
1. IH	1	0.210**	0.293***	0.065	0.192**	0.121
2. Adoption of data-driven information	0.290***	1	0.293***	0.319***	0.336***	0.531***
3. Felt responsibility	0.348***	0.431***	1	0.314***	0.236***	0.466***
4. Social distancing	0.151*	0.436***	0.404***	1	0.392***	0.522***
5. Handwashing/disinfecting	0.243***	0.406***	0.304***	0.453***	1	0.448***
6. Mask-wearing	0.218**	0.634***	0.547***	0.608***	0.506***	1

Note: Lower diagonal depicts the Pearson correlation coefficients; upper diagonal depicts the partial correlation coefficients after controlling for social desirability and political conservatism.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

In contrast to seeking data-driven COVID-19 information, IH did predict greater adoption of data-driven information—judging the information as more believable and convincing ($r = 0.29$, $p < 0.001$; these analyses were collapsed across experts' and non-experts' information sources as we did not assess adoption of information separately for each source). This link remained when accounting for controls; $r = 0.21$, $p = 0.001$. Together, these findings indicate that individuals high (vs. low) in IH are no more likely to seek out data-driven COVID-19 information; however, when they encounter data-driven information, they are more likely to adopt the information.

3.2.3 | Felt responsibility

As in Study 1, IH positively predicted felt responsibility ($r = 0.35$, $p < 0.001$). This link remained when including controls ($r = 0.29$, $p < 0.001$).

3.2.4 | Mediation analyses

Given the null link between IH and seeking data-driven information, we did not consider examining such information as a mediator. We did, however, conduct an SEM model (bootstrapped 5000 samples) to examine whether the link between IH (Time 1) and preventive COVID-19 practices (Time 2) was mediated by the adoption of data-driven information (Time 1) (Figure 5). We obtained a good model fit (WRMR = 0.70). As expected, we observed a significant mediation ($\beta = 0.24$, $p < 0.001$); IH related to higher adoption of data-driven information ($\beta = 0.38$, $p < 0.001$), which in turn predicted greater preventive COVID-19 behaviors ($\beta = 0.64$, $p < 0.001$).

As in Study 1, we next examined felt responsibility as a mediator (see Figure 6). The model fit was good (WRMR = 0.71) and the model indicated a mediation ($\beta = 0.21$, $p < 0.001$). IH predicted greater felt responsibility regarding COVID-19 ($\beta = 0.40$, $p < 0.001$), which in turn predicted greater preventive health practices ($\beta = 0.53$, $p < 0.001$). Including the control variables did not alter these findings (see SM).

A model with both mediators showed a poor fit to the data (WRMR = 1.17), surpassing the recommended cutoff (0.90; Yu & Muthén, 2002). Additional findings and interpretations are explained in SM.

3.3 | General discussion

We found that intellectual humility—intellectual openness to one's existing knowledge being potentially wrong—predicted greater engagement in preventive health practices during the COVID-19 pandemic. In Study 1, IH related to adopting information from data-driven sources (i.e., medical experts, other countries, and health history) and

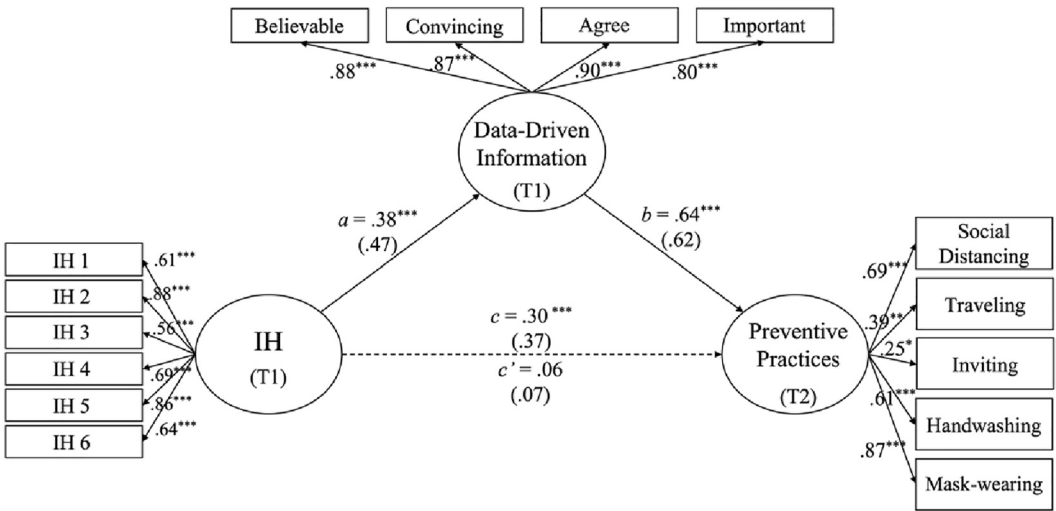


FIGURE 5 Mediation Model of IH, Adoption of Data-Driven Information, and Preventive Practices (Study 2). Unstandardized coefficients in parentheses. T1: Time 1; T2: Time 2. $***p < 0.001$, $**p < 0.01$, $*p < 0.05$.

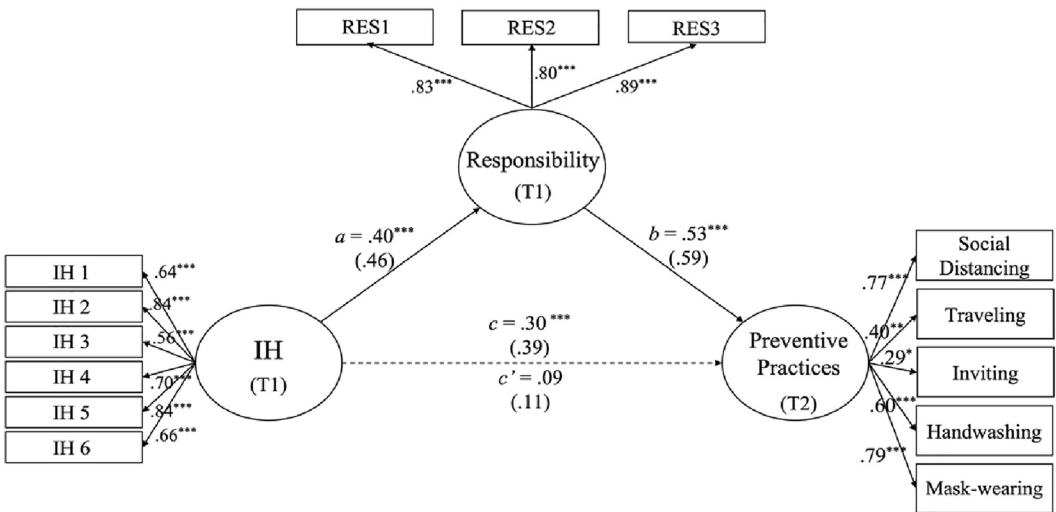


FIGURE 6 Mediation Model of IH, Felt Responsibility, and Preventive Practices (Study 2). Unstandardized coefficients in parentheses. T1: Time 1; T2: Time 2. $***p < 0.001$, $**p < 0.01$, $*p < 0.05$.

felt responsibility about taking preventive measures, which then predicted greater engagement in preventive health practices (e.g., social distancing). Study 2 replicated these findings across time (Time 2 was ~2–3 weeks after Time 1) targeting a time in the year—the winter holiday season—when it was particularly challenging to socially distance due to traditional social gatherings (e.g., holiday celebrations). Additionally, Study 2 clarified that the link between IH and engaging in preventive practices was not driven by a tendency to seek out data-driven COVID-19 information, but by adopting credible information when this information was already present.

Intellectual humility may be an important preceding factor of preventive behaviors in the COVID-19 context, where novel and mixed information is widespread. On top of aggregate-level factors (e.g., government policies; Hale et al., 2021), past research has documented individual level characteristics that predict engagement in social distancing and COVID-19 guidelines: for instance, political ideology (Allcott et al., 2020), trust in science (Fridman

et al., 2020; Roozenbeek et al., 2020), and felt responsibility (Lachowicz-Tabaczek & Kozłowska, 2021; Liu, 2021). We extend these findings and highlight the additional role of intellectual humility in such relationships. Also, and more broadly, our findings suggest that intellectual humility may be a promising psychological variable that policymakers and individuals can harness to make better informed health decisions.

We found that IH did not predict seeking of data-driven COVID-19 information. This finding, at first glance, stands in contrast to findings that IH predicts greater seeking out of information (e.g., Koetke et al., 2022). However, past works suggest that IH may increase the tendency to seek novel and/or counter-information specifically (Porter & Schumann, 2018; Reis et al., 2018) rather than any information. Future studies should explore potential boundary conditions in the relationship between IH and information-seeking, such as the novelty of information and whether information counters one's beliefs.

3.4 | Limitations and future research

Our studies contain limitations. First, because both studies were correlational, causal conclusions cannot be made. Second, in Study 2, we provided only one-sided preventive COVID-19 information to participants (all information pieces supported social distancing). Third, our findings may be context-specific in that the role of IH in health behaviors may be restricted in terms of the region (the U.S.) and topic (COVID-19). Future studies should replicate the observed links in other contexts and with other topics, for instance, in terms of vaccination behaviors, risky health behaviors (e.g., smoking), and general misinformation (e.g., sharing fake news). Another future direction could delve into specific components of IH that predict the aforementioned outcomes or examine the predictive power of IH over and above other personality factors that have been shown to relate to IH, such as openness and agreeableness (Porter et al., 2022).

4 | CONCLUSION

With the COVID-19 pandemic, the world has been experiencing a global health challenge that calls for individuals' civic engagement. Our findings suggest that intellectual humility—the tendency to admit the possibility of being wrong—may facilitate such engagement by adopting data-driven information and feelings of responsibility. In turn, our results raise the possibility that intellectual humility can encourage more informed and responsibility-based health decisions.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The datasets are available upon request.

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ENDNOTES

¹ Our use of the term “predict” throughout the paper refers to statistical prediction, and we do not intend to claim any causal predictions.

² All footnotes can be found in Supplementary Materials (SM).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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