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Intellectual humility's association with vaccine attitudes and intentions

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ABSTRACT

Vaccinations are critical to public health but uptake levels remain suboptimal. Intellectual humility, a virtue characterized by nonjudgmental recognition of one's own intellectual fallibility, may support the promotion of favorable vaccine attitudes. The current study investigated whether intellectual humility is related to anti-vaccination attitudes and intentions to vaccinate against the flu. Through an online survey management system, participants ($N = 246$, $M_{age} = 39.06$ years, $SD_{age} = 10.57$, 50.80% female, 79.20% White, 6.50% Black/African American, 7.80% Asian, 1.20% Hispanic/Latino, and 5.30% Other) completed a measure for intellectual humility, the anti-vaccination attitudes (VAX) scale, and a three-item flu vaccine intention scale. We found that intellectual humility negatively correlated with anti-vaccination attitudes. This correlation was largely driven by openness to revising one's viewpoint and lack of intellectual overconfidence. Additionally, we found that intellectual humility did not relate to flu vaccination intentions. Finally, we discuss the implications of these findings and their potential to support the eventual development of strategies to leverage intellectual humility into a health promotion strategy.

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In 2017, only 33.4% of young and middle age adults received the flu vaccine (Centers for Disease Control and Prevention; CDCP, 2017). Vaccinating against the influenza virus can lower the chance of contracting the virus and is crucial for public health (CDCP, 2018); however, vaccination uptake remains suboptimal. Intellectual humility, a virtue characterized by having a 'nonthreatening awareness of one's intellectual fallibility' (Krumrei-Mancusco & Rouse, 2016, p. 210), may help counter this trend. In this study, we investigated whether intellectual humility is related to vaccine attitudes and intention to vaccinate against the flu virus.

Intellectual humility

Although various definitions of intellectual humility exist (e.g. Davis et al., 2016; Hoyle et al., 2016; Samuelson et al., 2015), in this paper, we subscribed to a multidimensional conceptualization of intellectual humility, which has four facets (Krumrei-Mancusco &

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Rouse, 2016). First, independence of intellect and ego allows a person to be secure in their own opinions. Second, openness to revising one's viewpoint facilitates change in one's opinion when faced with convincing alternative evidence. Third, respect for other's viewpoints allows civil discourse to take place when discussing concepts or ideas despite holding a conflicting view. Finally, lack of intellectual overconfidence helps one avoid intellectual hubris.

Intellectual humility is often studied within contentious topics such as religion and politics (Hoyle et al., 2016; Leary et al., 2017; Porter & Schumann, 2018). For example, prior research demonstrates that people high in intellectual humility are less willing to perceive their religious views as superior and are more likely to label essays arguing the opposing religious view as accurate (Leary et al., 2017). Relatedly, researchers have found that intellectually humble pastors were more tolerant of diverse religious views (Hook et al., 2017). Regarding politics, research indicated that intellectually humble people were more likely to seek dissenting opinion articles about a contentious topic than articles confirming their own views (Porter & Schumann, 2018). These findings especially illustrate intellectual humility's facet of openness to revising one's viewpoint.

Furthermore, intellectual humility is also studied within areas of cognition (Krumrei-Mancuso et al., 2019). Intellectual humility's facet of lack of intellectual overconfidence appears to take the center stage in the topic of cognition. For instance, people with low intellectual humility are known to overestimate their performance on cognitive tests (Krumrei-Mancuso et al., 2019). When people overestimate their performance, it indicates an inflated view of self, which is inconsistent with the facet of lack of intellectual overconfidence. Furthermore, intellectual humility has a positive association with scores of general knowledge (Krumrei-Mancuso et al., 2019), which indicates that people who are intellectually humble are more knowledgeable in general. This relationship may exist because intellectually humble people are open to new information or because of their curiosity and mastery orientation (Krumrei-Mancuso et al., 2019).

These findings across different topics suggest that intellectual humility may help transcend a range of controversial beliefs (Hoyle et al., 2016) because it allows for civil discourse to occur and it may increase people's openness to opposing views. Increasing people's openness to opposing views is particularly important within vaccination research because people who know less about vaccinations inaccurately perceive themselves as knowing as much or more than healthcare professionals (Motta et al., 2018). Intellectual humility shows promise for applications in vaccination research because of its potential to open people to alternative views and its association with higher levels of knowledge. In particular, people who are high in intellectual humility may be more willing to reject inflexible anti-vaccination attitudes and may be more willing to consider vaccinating.

Attitudes toward vaccination

Vaccination attitudes are positive, negative, or neutral evaluations of vaccines (see Eagly & Chaiken, 1993). Recent research on anti-vaccination attitudes has conceptualized anti-vaccination attitudes as a multidimensional construct with four facets (Martin & Petrie, 2017). The first facet, mistrust of vaccine benefit, illustrates people's disbelief in vaccines' ability to protect against infectious diseases. For example, someone who does not trust in

the flu vaccine's ability to protect against the flu would most likely have anti-vaccination attitudes. The second facet of anti-vaccination attitudes is worries about vaccine's unforeseen future effects. A person who has anti-vaccination attitudes may have concerns about vaccines causing unforeseen complications. The third facet of anti-vaccination attitudes are concerns about commercial profiteering. Due to vaccines' affiliations with large production companies, people may question whether companies market vaccines to earn a profit or whether vaccines are a legitimate necessity for public health (Martin & Petrie, 2017). Finally, the fourth facet is preference for natural immunity (Martin & Petrie, 2017). Some people may hold the misconception that natural immunity is superior to any immunity vaccines could provide, which results in anti-vaccination attitudes.

As introduced, knowledge is an important element of intellectual humility (Krumrei-Mancuso et al., 2019) and may play a key role in determining how intellectual humility is related to vaccination attitudes. However, knowledge has a complicated relationship with vaccination attitudes and uptake. Some research shows that people who know less about vaccinations are more likely to receive them, in part, because they tend to rely on their health provider's recommendations (Larson et al., 2014; Leask et al., 2012; Redelings et al., 2012). Whereas, other research shows that people who know less about vaccinations are more likely to have negative attitudes towards vaccinations and are less likely to receive vaccinations (Larson et al., 2014; Martinello et al., 2003; Motta et al., 2018; Tong et al., 2008). For example, individuals who knew less about the relationship between autism and vaccines thought they knew as much or more than medical or scientific professionals (Motta et al., 2018). In other words, prior research demonstrates that increased knowledge may be related to increased negative attitudes toward vaccinations *and* decreased negative attitudes toward vaccinations.

A nuanced understanding of knowledge as it relates intellectual humility may assuage this apparent contradiction in the literature. Intellectual humility is related to one's general knowledge *and* is about understanding that one's knowledge can be wrong (Krumrei-Mancuso et al., 2019). Therefore, in one instance, people who know little about vaccinations but hold strong negative feelings toward vaccinations (i.e. low knowledge, strong anti-vaccinations attitudes; the Dunning-Kruger effect) may be low in intellectual humility because of their apparent intellectual overconfidence. Whereas in the other case, people who may have done extensive research and have a great deal of knowledge about vaccinations but hold strong negative feelings about vaccinations (i.e. high knowledge, strong anti-vaccination attitudes) may also be low in intellectual humility because their established knowledge leads them to be inflexible in their views and closed-off to the possibility of revising them. As such, we expect intellectual humility to be negatively related to anti-vaccination attitudes.

Vaccine intentions

Intention to vaccinate or vaccine intention is a popular outcome measure used to predict vaccination rates, especially in studies related to HPV vaccine or HIV prophylaxis (Barnack et al., 2010; Dhalla et al., 2012). Vaccine intentions are often measured in conjunction with vaccination attitudes as both are important in determining actual health behavior (i.e. theory of planned behavior; Ajzen, 1991; Kahn et al., 2003). Attitudes are also a common predictor of vaccine intentions in addition to the benefits

of vaccination, such as reduction of disease-related complications and a reduced need for medical attention (Myers & Goodwin, 2011). Additionally, knowledge of vaccines predicts vaccine uptake (Betsch & Wicker, 2012). Since knowledge of vaccinations is a significant predictor of vaccine behavior, intellectual humility could potentially aid in efforts to increase vaccination against the flu by opening people to scientific knowledge about vaccines that they may not have considered otherwise.

Summary and hypotheses

The current literature shows that intellectual humility is beneficial across various situations such as politics, religion, cognition (Hoyle et al., 2016; Krumrei-Mancuso et al., 2019; Porter & Schumann, 2018). However, it remains unknown whether intellectual humility is associated with anti-vaccination attitudes and flu vaccine intentions. The objective of the study was to investigate the relationships among intellectual humility, vaccine attitudes, and flu vaccine intentions. We hypothesized that participants who have higher levels of intellectual humility would have weaker anti-vaccination attitudes and stronger flu vaccine intentions.

Method

Participants

Participants ($N = 245$) were recruited from Amazon Mechanical Turk (MTurk) and were compensated 2.00 USD for their participation. Participants were eligible to participate if they were 18 or older and lived in the United States. We limited participation to U.S. residents because we wanted to investigate vaccine attitudes in the U.S. context. The mean age was 39.06 years ($SD = 10.57$), 50.80% were female, and the majority identified as White (79.20%; Black/African American 6.50%, Asian 7.80%, Hispanic/Latino 1.20%, Other 5.30%). See Table 1 for a summary of participant demographics.

Table 1. Summary of participant demographics.

Variable	Frequency	Percent
Sex		
Male	121	49.2
Female	125	50.8
Highest Level of Education		
High school graduate (high school diploma or equivalent including GED)	39	15.9
Some college but no degree	51	20.7
Associate degree in college (2-year)	35	14.2
Bachelor's degree in college (4-year)	101	41.1
Master's degree	15	6.1
Doctoral degree	2	0.8
Professional degree (JD, MD)	3	1.2
Race/Ethnicity		
White/Caucasian	194	79.2
Black/African American	16	6.5
Asian/Pacific Islander	19	7.8
Hispanic/Latino	3	1.2
Other	13	5.3

Measures

Intellectual humility was measured using the Comprehensive Intellectual Humility Scale (Krumrei-Mancusco & Rouse, 2016). The scale consisted of the four subscales: Independence of Intellect and Ego; Openness to Revising One's Viewpoint; Respect for Other's Viewpoints, and Lack of Intellectual Overconfidence. Participants indicated their agreement/disagreement to items across all subscales using a five-point Likert scale: (1) = *strongly disagree* to (5) = *strongly agree*. A higher score indicated higher intellectual humility.

Anti-vaccine attitudes were measured using the Vaccine Attitudes Examination (VAX) Scale (Martin & Petrie, 2017). The VAX scale contained four subscales: Mistrust of Vaccine Benefit, Worries about Unforeseen Future Effects, Concerns about Commercial Profiteering, and Preference for Natural Immunity. Participants indicated their agreement/disagreement with various statements using a six-point Likert scale (1) = *strongly disagree* and (6) = *strongly agree*. A higher score indicated stronger anti-vaccination attitudes.

Flu vaccine intentions were measured using a three-item flu vaccine scale (Sar & Rodriguez, 2019). Participants indicated their agreement/disagreement with these statements using a seven-point Likert scale (1) = *not at all* and (7) = *extremely likely*. See Table 2 for means, standard deviations, and Cronbach's alphas for all measures.

Procedure

All study materials and procedures were approved by the authors' Institutional Review Board. Participants clicked on a link for the online study hosted on Qualtrics, a survey management system. Following consent procedures, participants completed the study measures and provided demographic information. To control for potential order effects, the main study measures were presented in random order. Lastly, participants read a debriefing statement and were thanked for their participation.

Table 2. Summary of possible ranges, cronbach's alphas, means, standard deviations, and percentile scores for each scale and subscale.

Scale/Subscale	Possible Range	α	Mean	SD	Percentiles						
					5	10	25	50	75	90	95
Intellectual Humility overall	1–5	.90	3.75	0.59	2.82	2.95	3.39	3.82	4.14	4.45	4.73
Independence of intellect and ego	-	.94	3.42	1.16	1.51	2.00	2.40	3.70	4.40	5.00	5.00
Openness to revising one's viewpoint	-	.89	4.11	0.74	2.71	3.02	3.80	4.00	4.80	5.00	5.00
Respect for other's viewpoints	-	.89	4.23	0.70	3.00	3.33	3.83	4.33	4.83	5.00	5.00
Lack of intellectual overconfidence	-	.85	3.25	0.81	1.83	2.17	2.67	3.17	3.83	4.33	4.83
VAX scale overall	1–6	.86	2.34	1.16	1.00	1.10	1.40	2.00	2.93	4.29	4.80
Mistrust of vaccine benefit	-	.96	2.17	1.16	1.00	1.00	1.33	2.00	2.67	3.67	5.00
Worries – unforeseen future effects	-	.90	2.76	1.42	1.00	1.00	1.67	2.67	3.67	5.00	5.33
Concerns – commercial profiteering	-	.93	2.07	1.34	1.00	1.00	1.00	1.67	2.67	4.33	5.00
Preference for natural immunity	-	.93	2.32	1.40	1.00	1.00	1.00	2.00	3.00	4.67	5.33
Flu Vaccine Intentions	1–7	.86	3.60	1.95	1.00	1.00	1.92	3.33	5.33	6.67	7.00

N = 245.

Results

A correlation analysis was performed to test our hypotheses. We hypothesized that intellectual humility would be negatively associated with anti-vaccination attitudes and positively associated with flu vaccine intentions. The results supported the first hypothesis but not the second. Overall intellectual humility and overall anti-vaccination attitudes were negatively associated $r(237) = -.14, p = .04$. The subscales of Openness to Revising One's Viewpoint and Lack of Intellectual Overconfidence were largely responsible for driving this significant correlation. Openness to Revising One's Viewpoint was negatively correlated with Mistrust of Vaccine Benefits, $r(237) = -.22, p = .001$, Concerns about Commercial Profiteering, $r(237) = -.18, p = .004$, and Preference for Natural Immunity, $r(237) = -.20, p = .002$. Additionally, Lack of Intellectual Overconfidence was negatively correlated with Worries about Unforeseen Future Effects, $r(237) = -.21, p = .001$, Concerns about Commercial Profiteering, $r(237) = -.25, p < .001$, and Preference for Natural Immunity, $r(237) = -.28, p < .001$.

Overall intellectual humility and flu vaccine intentions were not significantly associated $r(234) = .08, p = .25$. However, flu vaccine intentions negatively correlated with the overall VAX scale and its subscales $r(234) = -.44, p < .001$. See [Table 3](#) for a summary of the correlations.

Discussion

We hypothesized that intellectual humility would be negatively associated with anti-vaccination attitudes, and the results confirmed this hypothesis. We also hypothesized that intellectual humility would positively correlate with flu vaccine intentions. However, the results failed to support the second hypothesis. Overall, the findings align with the current literature regarding intellectual humility's psychological benefits.

One possible explanation for the inverse relationship between anti-vaccination attitudes and intellectual humility might be intellectual humility's relationship to knowledge.

Table 3. Summary of correlations.

Variable	1	2	3	4	5	6	7	8	9	10
1. Intellectual Humility overall	–									
2. Independence of intellect and ego	.62**	–								
3. Openness to revising one's viewpoint	.73**	.18**	–							
4. Respect for other's viewpoints	.74**	.22**	.56**	–						
5. Lack of intellectual overconfidence	.72**	.14*	.50**	.42**	–					
6. VAX scale overall	-.14*	0	-.19**	.03	-.24**	–				
7. Mistrust of vaccine benefit	-.12	0	-.22**	-.03	-.13*	.83**	–			
8. Worries – unforeseen future effects	-.12	-.05	-.12	.06	-.21**	.91**	.60**	–		
9. Concerns – commercial profiteering	-.14*	.02	-.18**	.02	-.25**	.92**	.68**	.78**	–	
10. Preference for natural immunity	-.13*	.05	-.20**	.04	-.28**	.86**	.64**	.75**	.79**	–
11. Flu Vaccine Intentions	.08	0	.12	.03	.09	-.44**	-.48**	-.37**	-.35**	-.37**

$N = 245$. *Correlations are significant with $p < .05$ **Correlations are significant with $p < .01$.

This relationship could be explained by the associations between anti-vaccination attitudes and the intellectual humility facets of openness to revising one's viewpoint and lack of intellectual overconfidence. Specifically, it could be that people who are low in intellectual humility hold anti-vaccination attitudes because they have high levels of knowledge about vaccines, which may lead them become inflexible in their viewpoints. It could also be that people who are low in intellectual humility hold anti-vaccination attitudes because they have an unsubstantiated level of confidence for their level of knowledge (i.e. a Dunning-Kruger effect; Motta et al., 2018).

Additionally, since intellectual humility is positively associated with general knowledge (Krumrei-Mancuso et al., 2019), it may be that people who are more intellectually humble are less likely to subscribe to anti-vaccination attitudes because they are aware of scientific knowledge on the subject. Alternatively, it could be that people who show more intellectual humility may simply not agree with anti-vaccination attitudes but possess a neutral attitude towards vaccines because they are aware of alternatives, although not necessarily scientific arguments. For instance, when people with high intellectual humility sought out an opposing view, it did not indicate their agreement with the opposing view, but simply their openness to hearing alternative arguments (e.g. Porter & Schumann, 2018).

The second finding that anti-vaccination attitudes were negatively associated with flu vaccine intentions supports current literature on the relationship between attitudes and intentions. Previous research indicates that people who hold positive vaccine attitudes are more likely to have higher intentions to vaccinate (Kahn et al., 2003). Our current findings add further support to past literature by demonstrating that anti-vaccination attitudes inversely relate to flu vaccine intentions. Vaccine attitudes are a known predictor of vaccine intentions (Myers & Goodwin, 2011) so it follows that people, who were more likely to agree with anti-vaccination attitudes, were subsequently less likely to intend to vaccinate against the flu.

Lastly, the finding that flu vaccine intentions did not correlate with intellectual humility warrants further research into the subject. The lack of association could be due to limitations of the current study such as the time of year the study took place as discussed in the limitations section. Alternatively, it could be that people who were intellectually humble were open to knowledge about vaccines, which predicts intentions (Betsch & Wicker, 2012), but have not come into contact with a convincing enough argument. Intellectually humble people are open to alternative viewpoints (Hoyle et al., 2016; Krumrei-Mancuso et al., 2019; Porter & Schumann, 2018); however, remaining open to an argument does not guarantee agreement or the revising of one's viewpoint. Perhaps, intellectually humble people are open to information but have not come into contact with an argument that has convinced them to vaccinate against the flu, especially during the summer months.

Given the associations found, it is possible that intellectual humility may be useful as a health-promotion strategy in the future. For example, other researchers have found that people may temporarily change their levels of humility (e.g. Kruse et al., 2017). Thus, it may be possible that manipulations to increase momentary (state) levels of humility, such as expressing gratitude (Kruse et al., 2014) or engaging in experiences that increase the feeling of awe (Stellar et al., 2018), may decrease anti-vaccination attitudes. Further study is needed to investigate what specific strategies can increase intellectual humility, and

how such an increase may affect vaccination attitudes and intentions to vaccinate against the flu. Special attention may need to be paid to the role of care providers (e.g. Huynh & Dicke-Bohmann, 2020; Huynh et al., 2018). The current study lends evidence to support the potential development of future interventions by establishing that a relationship exists between intellectual humility and anti-vaccination attitudes.

Limitations and future directions

Some limitations of the study are the time of year the study took place, the study's specific focus on the influenza vaccination, and correlational design. Flu season takes place during the months of January-October (CDCP, 2018). The current study took place over the summer months, which could have resulted in overall lower vaccination intentions due to the season. Future studies may consider investigating intentions during the height of flu season, which may result in overall higher intentions to vaccinate as there is a present and motivating need for the flu vaccine at that time. Additionally, the current study only focused on the flu vaccine. It remains unknown whether the results of the current study may generalize to other vaccinations as it is known that vaccine attitudes (i.e. vaccine hesitancy) varies from vaccine to vaccine (MacDonald, 2015). Therefore, caution should be exercised when generalizing the results of this study to other vaccines. Finally, the current study is correlational in nature. Even if flu vaccination intentions and/or behaviors directly correlated with intellectual humility, experimental manipulation would still be needed to determine causality. Future studies should investigate if intellectual humility can be induced and used to alter vaccine attitudes, intentions, and uptake.

Conclusion

Flu vaccinations are an important part of public health, but still suffer from suboptimal participation rates. Our study provides evidence for intellectual humility's inverse relationship with anti-vaccination attitudes. With further research, intellectual humility may be included in future public health efforts to increase flu vaccine uptake.

Disclosure statement

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