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Title

COVID-19 Vaccination: Conspiracy Theories, Demography, Ideology and Personality Disorders.

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Abstract

Objectives: To understand the role of personal experience, religious and political beliefs as well as conspiracy theory beliefs on the acceptance of Covid-19 vaccination. **Method:** Just under four hundred adults completed online questionnaires assessing to what extent they endorsed conspiracy theories (CTs) and an evidenced measure of Personality Disorders (PDs). One month later, they were asked about having the COVID-19 vaccine. We examined the relationship between demographic (age, sex, education), ideology (political and religious beliefs), general beliefs in CTs, PDs and attitudes towards vaccination. **Results:** We found, as anticipated, conservative political orientation, religiosity, Cluster A PDs, and conspiracy thinking correlated negatively with vaccine acceptance. Analysis of Variance (ANOVA) showed that the group of vaccine accepting individuals differed from the group of individuals either hesitant or resistant to the vaccine with respect to education, personal ideology, general conspiracy theory adherence, and cluster A PDs. Multinomial logistic regression indicate that religiosity, conspiracy thinking, and lower levels of education predict vaccine hesitancy or rejection. **Conclusion:** Implications for “rolling out” the vaccine are discussed in terms of who to target and how to address misbeliefs about vaccination.

Key Words: Covid-19 Vaccine; conspiracy theories; demography, personality disorders.

COVID-19 has very serious health consequences for individuals and society as a whole. With more than 2.6 million deaths worldwide and restrictions curbing the economy and impacting the lives of billions, developing and obtaining vaccines has been a key priority for health authorities around the world. There is general agreement that vaccines are our best weapon against the virus, yet studies report that not everybody is willing to take the vaccine,

limiting the likelihood of obtaining herd immunity (e.g., Khubchandani et al., 2021; Murphy, et al., 2021). To stop the spread of the COVID-virus, around 70 % of the population must be immune to the virus (Bartsch et al., 2020). It is therefore of key importance to understand how to encourage these individuals to accept getting vaccinated. It was the aim of this study to examine the characteristics of individuals unwilling to get a vaccine. More specifically, we examined the relationship between the rejection of a COVID-19 vaccine and a person's demography (sex, age, education), ideology (religious and political beliefs), their belief in conspiracy theories, and their sub-clinical personality disorders.

COVID-19 Research

There is an academic literature on the acceptance vs rejection of vaccination (Habersaat & Jackson, 2020; Hornsey et al., 2018; Larson et al., 2014; Marti et al., 2017; Schmid et al., 2017; Siddiqui et al., 2013). Some have been interested in vaccine conspiracy theories. Conspiracy theories are beliefs that attribute the ultimate cause or concealment of an event or behavioural pattern from public knowledge, to secret, unlawful, and malevolent plots or processes usually by multiple actors working together (Zonis & Joseph, 1994).

Some have focused on individual differences (Amit Aharon, et al., 2018; Johnson, 2000; Patty et al., 2017; Rieger, 2020), and several studies in different countries with vaccinations against different infections have confirmed that refusal/hesitancy is associated with conspiracy beliefs (Jegede, 2007; McHale et al., 2016; Murakami, et al., 2014). Therefore, the current crisis has provided a wonderful opportunity for both conspiracy theorists (CTs), as well as those who study them. Studies done in many different countries (e.g., Ecuador, Great Britain, Turkey, USA) soon after the start of the crisis examined a range of correlates of specific COVID conspiracy theories (CCTs) (Alper et al., 2020; Chen et al., 2020; Pummerer et al.,

2020; Šrol et al., 2020; van Mulukom et al., 2020a). Nearly all the published studies were however conducted before any vaccines were available. Some studies tried to anticipate the reasons why some (Europeans) would accept vs reject the vaccination once it was developed (Neumann-Böhme et al., 2020). In this study, however, we asked people in February 2021 “Have you had the COVID-19 vaccine, or do you intend to have the COVID-19 vaccine if it is offered to you?”. Being asked at a time when mass vaccination programs were being rolled out, many of our respondents were faced with a question that was more actual than hypothetical in nature.

There are a few highly salient papers relevant to this study. Murphy et al. (2021) argued that the existing literature indicated that there are likely to be several factors - personality, cognitive styles, emotion, beliefs, trust, and socio-political attitudes - that distinguish between those who are hesitant or resistant to a COVID-19 vaccine and those who are accepting. They found with samples drawn from two populations, conducted in Ireland and the UK that there were similar rates of vaccine hesitance (26% and 25%) and resistance (9% and 6%). Also, in both populations those resistant to a COVID-19 vaccine were less likely to obtain information from traditional/authoritative sources and had similar levels of mistrust in these sources compared to vaccine accepting respondents. From their data Murphy et al. (2021) described the profile of vaccine hesitant/resistant persons, compared to the vaccine accepting, as being more self-interested, more distrusting of experts and authority figures (i.e., scientists, health care professionals, the state), more likely to hold strong religious beliefs as well as conspiratorial and paranoid beliefs about the intentions of others. They were also more likely to believe that their lives are primarily under their own control, to have a preference for societies that are hierarchically structured and authoritarian, and to be more intolerant of migrants in society.

Freeman et al. (2020) administered an online survey to 2501 respondents in England in May 2020. They found that higher levels of coronavirus conspiracy thinking were associated with less adherence to government guidelines and less willingness to be vaccinated. Coronavirus conspiracy thinking was also related to other conspiracy beliefs, to distrust in institutions and authorities, and to paranoia. Hence, conspiracy thinking and paranoid ideation appear to be important for vaccine rejection.

Lazarus et al. (2021) surveyed 13,426 people in June 2020 from 19 countries to determine potential acceptance rates and factors influencing acceptance of a COVID-19 vaccine. In all, 71.5% of participants reported that they would be very or somewhat likely to take a COVID-19 vaccine, while 48.1% reported that they would accept their employer's recommendation to do so. Predictably older, better educated and wealthier people were more likely to accept the vaccine. Further, respondents reporting higher levels of trust in information from government sources were more likely to accept the vaccine and take their employer's advice to do so. Thus, age, level of education, and trust in authorities seem to be important factors for vaccine acceptance.

This Study

We were interested in four groups of variables associated with vaccine uptake. Based on the extensive previous literature we predicted females more than males (H1), older more than younger (H2) and better rather than less well educated (H3) people would be more likely to accept the vaccine, we believe that less politically conservative (H4) and less religious (H5) people would be more likely to take up the vaccine.

In the current study we concentrated on conspiracy theories (CTs) and particularly COVID-19 conspiracy theories (CCTs) (Imhoff, & Lamberty, 2021; Leibovitz et al., 2021)

Conspiracist beliefs and theories are defined as essentially false narratives where multiple agents are believed to be working together toward malevolent ends (Swami et al., 2011; 2016a). Douglas et al. (2019) note that they are essentially attempts to explain the ultimate causes of significant social and political events by claims of secret plots concerning two or more powerful actors.

Studies on CCTs has yielded some predictable results. Testing an international group of over 600 adults, Georgiou et al. (2020) found that CCT beliefs were strongly related to broader CT beliefs, higher in those with lower levels of education and positively correlated with more negative attitudes towards government responses to the pandemic. In a Turkish study of over 1,000 adults, Alper et al. (2020) found CCT beliefs to be associated with higher faith in intuition, uncertainty avoidance, impulsivity, generic conspiracy beliefs, religiosity, and right-wing ideology, and a lower level of cognitive reflection. In an important review, van Mulukom et al. (2020b) noted that there are many studies on individual difference variables (demographic variables, personality traits, coping with threat and uncertainty), beliefs, biases, attitudes (epistemically suspect beliefs, thinking styles and cognitive biases, attitudes towards science), and social factors (group identities, trust in authorities, social media) related to COVID-19 conspiracy theories. They concluded that beliefs in CCTs are boosted by low levels of trust in a context of threat and low levels of comprehensive, accessible information in a context of uncertainty and unknowns. We therefore predict the more a person believes in CTs, the less enthusiasm they would express for the vaccine (H6).

In this study, we also examined (sub-clinical) personality disorder (PDs) potential correlates of vaccine attitudes, which we believe has never been examined before. Studies on (normal) personality correlates of vaccine attitudes suggest that Neurotics would be less, and Conscientious people more, enthusiastic about vaccines (Martinsen et al., 2021). Thus, it maybe supposed that those PDs which are most closely correlated with Neuroticism (like

Borderline PD) and Conscientiousness (like OCD) would be most related to vaccine acceptance. Martinsen et al. (2021) found as predicted that those PDs associated with externalising were most related to maladaptive reactions to the Covid-19 crisis.

Of all the debates in psychiatry the existence, classification and treatment of the PDs remains one of the most controversial (Tyrer, 2020). Nevertheless, to examine and classify enduring personality dysfunctions has been a major endeavour within psychology and psychiatry for more than a century. When the diagnostic manual DSM-III was published in the 1980s, PDs were conceptualised as lying on a separate axis than the other mental disorders, signifying that these disorders were more enduring and pervasive across a broad range of personal and social settings. PDs influence the *sense of self* - the way people think and feel about themselves, and how they relate to the people around them. The enduring patterns, or traits, related to the different PDs affect people's cognition, i.e., the way they perceive themselves, others, and events, affectivity and ability to express and understand emotions, and interpersonal functioning. It is only when these patterns become inflexible and maladaptive we use the term PD. The classification and nomenclature of the disorders have varied since the introduction of the DSM-I in 1952. In the current version of the DSM, the DSM-5, 10 different PDs, plus six in the appendix, are listed. There have also been various parsimonious attempts at a "higher order" classification of the personality disorders. The DSM system uses the well-established system of dividing the PDs into three clusters, Cluster A, B and C. Cluster A is related to odd or eccentric behaviour, Cluster B to dramatic, emotionally unstable and erratic behaviour, and Cluster C to anxiety, fearfulness and avoidant behaviour.

Various attempts have been made to "map" these into other three-fold systems like Horney's Moving Away, Against, Toward Others, Eysenck's Neurotic, Psychotic and Extraversion, and the Intrapunitive, Extrapunitive and Impunitive system (Furnham, 2021). Cluster A is related to suspiciousness and not following the norms of society. A tendency to

believe in CT has also been linked to Cluster A (Furnham & Grover, 2021), and Freeman et al. (2020) found an association between coronavirus conspiracy beliefs and paranoia and lack of trust in authorities. Hence, we expect people with Cluster A traits to be less prone to accept the COVID- vaccine (H7). We assume that Cluster B, which include Antisocial PD, to be associated with not being compliant with health authorities guidelines and advice, and therefore negatively related to vaccine acceptances (H8). The relation between Cluster C PDs and vaccine hesitancy is somewhat more difficult to predict. We might expect this group to be more worried about being infected by the COVID, thereby making them more inclined to accepting the vaccine. Conversely, we could expect people with Cluster C traits to be more worried about side effects, thus leading them to be more hesitant towards the vaccine. We might also expect that avoidance behaviour might inhibit them from having the vaccine. In sum, we find it difficult to predict any relationship between Cluster C and vaccine acceptance. We do however include Cluster C PDs in our study in order to examine how this cluster and related PDs relate to vaccine hesitancy and residence.

Method

Transparency and Openness

We adhere to the Transparency and Openness Promotion (TOP) guidelines at the levels specified by Health Psychology. The study reported below was conducted in line with the Declaration of Helsinki and the guidelines of the American Psychological Association (APA). Ethics permission was sought and received (UCL Centre for Clinical, Health and Educational Psychology: CEHP/514/2017). In this article, we follow the Journal Article Reporting Standards for Quantitative Research (JARS-Quant) by APA. The study was not pre-registered, and we did not pre- register a statistical analysis plan. All data is obtainable from the first author

upon request. Data were analyzed using IBM SPSS version 27.0 (IBM Corp., 2020). Analysis code, survey items, and information about copyrighted material used in the study are available at https://osf.io/eqg7d/?view_only=21ae781ec78a46ddbce26029c8a83f2a.

Participants

In all, 397 people took part in this study: 195 male, 199 female and 3 non-binary. They ranged in age from 19 to 71, with a mean of 39.9 years ($SD = 11.63$ years). In all, 54% were college graduates, 93% were British nationals, and 60.3% owned their own homes. They were all working, and not full-time students, and indicated their occupation which were very varied, including accountancy, health work and IT.

Measures

First Round of Data Gathering

Conspiracy Thinking (Walter & Drochon, 2020). This is a 10-item scale devised as part of the Conspiracy and Democracy project at the University of Cambridge. It consisted of 10 statements that are generic in nature and not connected to any specific societal, economic or political systems. The scale was administered to over 11,000 people and was examined for its psychometric properties. In the current study the Cronbach's α for this scale was .60.

Belief in Conspiracy Theories (BCTI) (Swami et al., 2011). A 15-item measure that describes a range of internationally popular conspiracy theories. Participants rated their belief that each conspiracy was true on a 9-point scale, ranging from 1 (*Completely false*) to 9 (*Completely true*). An overall score was computed with the mean of all items, with higher scores reflecting greater belief in conspiracy theories. Scores on this measure have been shown to be one-dimensional (Swami et al., 2011) and correlate strongly with scores from a generic measure of conspiracist ideation ($r = .88$; Brotherton et al., 2013). In the present study, Cronbach's α for the BCTI was .91.

Coolidge Axis-II Inventory – Short Form (SCATI) (Coolidge, 2001). This 70-item self-report measure assesses 14 personality disorders, 10 from *DSM-V*, 2 from Cluster B of the *DSM-IV-TR* (Depressive and Passive Aggressive) and 2 from *DSM-III-R* (Sadistic and Self-Defeating). The SCATI has good internal scale and test-retest reliability and been used to predict PDs in subclinical (Coolidge, Segal, Cahill & Simenson, 2010) and clinical (Watson & Sinha, 1996) populations. The reliability (α) of this measure in this study is as follows: Antisocial (.58), Avoidant (.74), Borderline (.64), Dependent (.60), Depressive (.81), Histrionic (.56), Narcissistic (.65), Obsessive-Compulsive (.68), Paranoid (.74), Passive-Aggressive (.63), Sadistic (.66), Self-defeating (.64), Schizotypal (.63), and Schizoid (.70). Using the DSM-5 values for the three clusters were calculated: A (odd and eccentric ($\alpha = .73$), B (dramatic, emotional or erratic) ($\alpha = .72$) and C (anxious or fearful disorders) ($\alpha = .73$).

Participants also rated their beliefs on various 10-point scales: Religious (Not at all = 0 to Very = 10) ($Mean = 2.29, SD = 2.90$), Politics (Conservative = 0 to Liberal = 10) ($Mean = 5.55, SD = 2.46$) and Ambitious (Not at all = 0 to Very = 10) ($Mean = 5.49, SD = 2.71$). Using a 100-point scale they also rated their Physical Health ($Mean = 67.69, SD = 18.68$), Intelligence ($Mean = 66.99, SD = 15.17$) and Emotional Intelligence ($Mean = 68.47, SD = 17.98$).

Second Round of Data Gathering

COVID-19 Question. Participants were asked, ‘Have you had the COVID-19 vaccine, or do you intend to have the COVID-19 vaccine if it is offered to you?’. Responses were classified as vaccine accepting if they responded ‘Yes’, hesitant if they responded ‘Maybe’, and resistant if they responded ‘No’.

Procedure

Participants were recruited through Prolific.ac, an online participant database. Prolific was chosen over alternative online recruitment websites, due to its greater diversity of

participants. We specified that people had to be employed. All measures except the *COVID-19 Question* was administered in January 2021. One month later, in February 2021, we asked participants the Covid-19 question. The survey took an average of 21 minutes to complete, and participants were paid £2.00 after completing the survey.

Results

We inspected the data for missing values. For most variables, there were very few missing responses (less than 3). However, there were in total 66 missing values for the Covid-19 question (i.e., for vaccine acceptance, vaccine hesitancy and vaccine resistance), and 37 missing responses for the question concerning religiosity. Respondents with missing values were removed from the analyses through listwise deletion. We examined the characteristics of respondents and non-respondents in order to inspect if these groups differed in any systematic way. Except from a non-significant difference in age between people who responded to the question related to religiosity (mean age = 40.21) compared to the group that did not respond to this question (mean age = 36.68) ($t(395) = -1.77, p = .078$), few systematic differences between respondents and non-respondents were found in our sample.

Insert Table 1 here

Table 1 provides a summary of the correlation between the measures. As anticipated, conservative political orientation, religiosity, cluster A personality traits, and conspiracy thinking correlated negatively with vaccine acceptance. Education, operationalized as having a university degree, correlated positively with vaccine acceptance. Contrary to expectations

sex, age, and cluster B personality traits did not significantly correlate with vaccine acceptance. Conspiracy Thinking and beliefs also correlated negatively with education, and positively with political conservatism and religiosity. We also found, as anticipated, a significant positive correlation between BCTI and all the PD clusters, and a positive correlation between Conspiracy Thinking and Cluster A and B, but not Cluster C. The correlation between the two measures of CT, Conspiracy Thinking and BCTI, was moderate to strong ($r = .58$).

Insert Table 2 and 3 here

In order to examine the characteristics of vaccine acceptant, vaccine hesitant and vaccine resistant respondents, we performed a series of one-way between-groups analysis of variance (ANOVA) tests with Bonferroni corrected post-hoc tests. For the two binary dependent variables, sex (the three non-binary respondents were not included in the analysis) and education (operationalized as holding an academic degree or not), the chi-square test of independence was used. Results are displayed in Table 2. Results yielded no statistical significant age or sex differences between the groups. In line with H3, the groups varied in relation to education ($\chi^2(2, N = 331) = 15.55, p < .001$), and the proportion having an academic degree was highest for the vaccine accepting group. However, the mean difference in education between the group of vaccine acceptant respondents and the group of vaccine resistant respondents was not significant ($\chi^2(1, N = 276) = 2.79, p = .095$).

Vaccine accepting respondents were, consistent with H4, less politically conservative than the vaccine hesitant respondents ($F(2, 328) = 8.09, p < .001$). The vaccine resistant group was, however, not statistically significantly different from the two other groups in terms of political orientation. There were significant differences between the groups with respect to

religiosity ($F(2, 301) = 5.63, p = .004$). In line with H5, vaccine accepting respondents were less religious compared to vaccine hesitant and vaccine resistant respondents. With respect to PD traits, the vaccine accepting group had a lower degree of Cluster A related personality problems compared to the vaccine hesitant group ($F(2, 329) = 5.00, p = .007$). This was in line with H7. The differences in Cluster A scores between vaccine resistant people and vaccine accepting people did not reach statistical significance in our sample ($p = .381$). There were no statistically significant differences between the groups with regard to Cluster B and Cluster C personality traits. Hence, H8 was not supported by our data. For the CT, both measured by Conspiracy Thinking and BCTI, the vaccine hesitant and vaccine resistant group had higher mean scores than the vaccine accepting group, thus supporting H6 (for Conspiracy Thinking: $F(2, 239) = 38.38, p < .001$. For BCTI: $F(2, 239) = 14.78, p < .001$).

Multinomial logistic regression was applied in order to identify demographic and psychological indicators of vaccine acceptance, vaccine hesitancy, and vaccine resistance (see Table 3). Vaccine acceptance was set as the reference category to identify factors associated with vaccine hesitancy and vaccine resistance, respectively. Subsequently, we analyzed the data with the vaccine hesitant group set as the reference category to identify which factors distinguished vaccine resistant respondents from vaccine hesitant respondents (see Table 3). Contrary to expectation, sex and age did not predict vaccine acceptance: thus, H1 and H2 were not supported by our findings. People without a university degree were more likely to be vaccine hesitant relative to people with a degree. Education did, however, not distinguish between vaccine acceptance and vaccine resistance: H3 was therefore only partially supported by our data. Political orientation did not predict vaccine hesitancy or vaccine resistance when vaccine acceptance was used as a reference group. Thus, H4 was not supported by our findings. Being religious was, however, predictive of vaccine hesitancy and vaccine resistance in line with H3. The PD Clusters did not add any predictive value when included in the regression.

Hence, H7 and H8 were not supported by our findings. Further, none of the variables included were significant for distinguishing between vaccine hesitancy and vaccine resistance.

In order to gain a more fine-grained picture of the relationship between PD and vaccine hesitancy, we conducted the binary logistic regression with the 14 PDs instead of the three clusters. The only PD that predicted vaccine acceptance when controlling for all other variables was Schizotypy ($AOR = .827, p = .05$).

In summary, sex and age did not distinguish significantly between vaccine acceptance and being hesitant to or resistant to taking the COVID-vaccine; education was positively related to vaccine acceptance; vaccine accepting respondents were on average less politically conservative than vaccine hesitant people; political orientation did however not significantly predict vaccine acceptance when controlling for other variables included in the study; more religious people were less likely to be vaccine accepting; cluster A PDs were less prevalent in the vaccine accepting group than in the vaccine hesitant group; however, none of the PDs predicted vaccine acceptance when controlling for conspiracy theory beliefs; Conspiracy theory beliefs was negatively related to vaccine acceptance.

Discussion

As we write this (late 2021) vaccines are being rolled out all over the world in an effort to stop the COVID-19 pandemic. With daily death tolls soaring past 10,000 in the start of 2021 (WHO, n.d.), and with millions of people affected by the economic consequences, restrictions and lock-downs due to the virus, the newly developed vaccines raise hope that people can go back to a normal state of living. However, for the vaccine to be efficient in suppressing the virus, a substantial proportion of the population need to be vaccinated (Bartsch et al., 2020; Britton et al., 2020; Kwok et al., 2020; O’Callaghan et al., 2020). However, studies with

samples from several countries indicate that a significant proportion of people do not intend to take the vaccine if it is offered to them. Thus, in order to stop the pandemic health authorities need to identify people who are hesitant to taking the vaccine. Secondly, they need to understand how to communicate efficiently with these people in order to influence their attitude towards, and inclination to take, the COVID vaccine. This study, building and expanding on previous studies related to vaccine hesitancy, contributes to both these issues by identifying key indicators of vaccine hesitancy and resistance, and by examining psychological characteristics that predict vaccine acceptance, hesitancy and resistance. As far as we know, this is also the first study to examine how personality pathology dimensions willingness to take a COVID-vaccine.

Our findings suggests that the group of people who are either hesitant or skeptical to vaccination are more religious and politically and socially conservative relative to vaccine accepting individuals. Further, our findings do not indicate, contrary to expectations, that gender and age are important characteristics in identifying people skeptical towards vaccination. Several other studies have found an association between vaccine acceptance and age and gender (e.g., AlShurman, Khan, Mac, Majeed, & Butt), and the lack of support for these relationships in our findings might be due to limited power or demographic variability in our sample.

As predicted, an inclination to believe in conspiracy theories did predict vaccine hesitancy and vaccine resistance. This indicates that CT is a key factor in understanding the psychological mechanism underlying vaccine hesitancy and resistance. We expected that Cluster A and Cluster B would relate negatively to vaccine acceptance. However, for Cluster B personality traits, no significant associations were found in our sample. In line with expectations, we found that the vaccine accepting respondents in our study had a lower degree of Cluster A related personality pathology than people who were hesitant to taking the vaccine.

Nevertheless, when all variables were included in a logistic regression, none of the clusters predicted vaccine acceptance. We examined the role of Cluster A personality problems and, in our sample, Cluster A PD did not predict vaccine acceptance when CT was controlled for. This might indicate that the key component in Cluster A PD, related to vaccine hesitancy and resistance is a tendency to believe in conspiracy theories (Martinsen et al., 2021). When examining the 14 different PDs included in SCATI, we found that only Schizotypy predicted vaccine acceptance. Schizotypy is a PD related to have incorrect interpretation of casual incidents, being preoccupied with ideas outside the norms of society, and suspiciousness, and Schizotypy has in previous studies been linked to a propensity to believe in conspiracy theories (e.g., Darwin, Neave & Holmes, 2011; Swami, et al., 2013). People with Schizotypal personality disorder typically have few close friends and confidants, restricting social corrective information and influence. Thus, the tendency to believe in CT and schizotypal traits, such as suspiciousness, lack of social input due to social isolation, and ideas of reference (i.e., tendencies to interpret events and casual relationship incorrectly), seem to be the most important psychological factors for understanding why some people avoid vaccination against the SARS-CoV-2 virus which has caused the COVID-19 pandemic.

We believe this study has two outputs. The first is practical. To improve health authorities' ability to identify groups that are skeptical towards the COVID-19 vaccine and to better understand psychological mechanisms underlying vaccine resistance/hesitancy in order to tailor communication better to the sceptics. It also has theoretical implications, namely to better understand the link between PDs, CT and health related behavior.

This study underlined the fact that ideological factors (political and religious beliefs) play a major part in vaccine acceptance. This suggests health authorities may do well to influence religious and political leaders in trying to promote the "vaccination message" using religious sites as places to obtain vaccines. Further, it seems important to target conspiracy

theory websites and groups because of the established relationship between health worries and behaviors and conspiracy theories (Swami et al., 2016b).

Like all others, this study had limitations. We chose to “trade off” population sample size for more detail about each individual. In this study participants took around twenty minutes to complete over 100 questions. However, we had a sample of just under 400 people which was biased towards younger and better educated people. This may have accounted for the fact we did not find sex and age differences. It would have been ideal to know more about each individual, especially their health record and their behaviour during the “lock-down” period as this may be closely related to their attitudes towards vaccination.

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Table 1

Pearson's Correlations between Vaccine Acceptance, Demographical Indicators and Psychological Indicators.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Vaccine Acceptance	—								
2. Sex	0.056	—							
3. Education	0.208 ***	0.059	—						
4. Political Orientation	0.214 ***	0.027	0.237 ***	—					
5. Religion_1	-0.189 ***	0.082	0	-0.17 **	—				
6. Cluster A	-0.166 **	0.005	0.003	-0.057	0.026	—			
7. Cluster B	-0.057	-0.05	0.151 **	0.04	0.038	0.542 ***	—		
8. Cluster C	-0.001	0.081	0.145 **	0.136 **	-0.062	0.73 ***	0.516 ***	—	
9. Conspiracy Thinking	-0.435 ***	-0.059	-0.215 ***	-0.205 ***	0.072	0.311 ***	0.196 ***	0.057	—
10. BCTI	-0.287 ***	0.042	-0.115 *	-0.151 **	0.187 ***	0.353 ***	0.276 ***	0.156 **	0.581 ***

Note. * p < .05, ** p < .01, *** p < .001

Table 2

Mean Differences in Scores between Vaccine Acceptant, Vaccine Hesitant and Vaccine Resistant respondents.

	Vaccine acceptant ^a		Vaccine heistant ^b		Vaccine resistant ^c	
	Mean	SD	Mean	SD	Mean	SD
Sex	0.519	0.501	0.473	0.504	0.429	0.502
Age	40.330	11.386	39.310	10.772	38.720	12.510
Education	0.606^b	0.490	0.327^a	0.474	0.444	0.504
Political Orientation	5.87^b	2.405	4.59^a	2.295	4.889	2.053
Religiosity	1.928^{bc}	2.631	3.04^a	3.057	3.2727^a	3.485
Cluster A	26.697^b	6.892	29.855^a	7.499	28.639	7.885
Cluster B	34.178	6.860	35.836	7.460	33.972	8.907
Cluster C	30.087	6.858	30.255	6.165	29.889	7.452
Conspiracy Thinking	0.925^{bc}	0.808	2.091^a	1.543	2.139^a	1.791
BCTI	38.905^{bc}	19.430	52.364^a	23.669	52.944^a	22.182

Note. ^{abc} = mean difference between denoted categories is significant at a significance level of $\alpha = .01$. Statistically significant comparisons are in bold.

Table 3

Indicators Associated with Vaccine Acceptance, Vaccine Hesitance and Vaccine Resistance.

	Have you had the COVID-19 vaccine, or do you intend to have the COVID-19 vaccine if it is offered to you?								
	Reference = Vaccine acceptance (yes)						Reference = Vaccine hesitance		
	Vaccine hesitance (maybe)			Vaccine resistance (no)			Vaccine resistance (no)		
	AOR (Exp(B))	95% CIs		AOR (Exp(B))	95% CIs		AOR (Exp(B))	95% CIs	
	Lower	Upper		Lower	Upper		Lower	Upper	
Sex	0.907	0.445	1.847	0.749	0.330	1.702	0.826	0.328	2.081
Age	0.985	0.953	1.018	0.968	0.931	1.007	0.983	0.940	1.027
Education	0.405*	0.192	0.858	0.688	0.293	1.612	1.696	0.621	4.632
Political Orientation	0.868	0.741	1.017	0.965	0.803	1.161	1.112	0.901	1.372
Religiosity	1.126*	1.001	1.266	1.147*	1.008	1.305	1.019	0.882	1.176
Cluster A	1.067	0.981	1.161	1.052	0.954	1.161	0.986	0.882	1.101
Cluster B	1.004	0.947	1.065	0.952	0.887	1.023	0.948	0.876	1.027
Cluster C	0.942	0.860	1.032	0.952	0.859	1.056	1.011	0.896	1.141
Conspiracy Thinking	1.99**	1.366	2.908	2.204**	1.455	3.339	1.106	0.761	1.608
BCTI	0.998	0.979	1.018	1.000	0.978	1.022	1.002	0.978	1.027

Note. Results from multinomial logistic regression. ** $p < .01$, * $p < .05$. AOR = Adjusted Odds Ratio.