Differing Opinions: COVID-19

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In March of 2020, the WHO declared the coronavirus outbreak a pandemic, and called for all countries to implement precautionary measures geared towards containing the virus (WHO, 2020). Governments all over the world implemented policies such as lockdowns, social distancing measures, mask mandates, and curfews to help limit the spread of the coronavirus disease 2019 (COVID-19). The effectiveness of these mandates to accelerate society's return to normalcy relies heavily on individual attitudes and behaviors (Kleitman et al., 2021). However, there has been an increase in polarization of opinions about the pandemic. Thus, it is important to explore individual differences in attitudes and beliefs in order to recognize factors that could facilitate compliance to health mandates. Furthermore, with the large-scale rollout of vaccination, public opinion about COVID-19 and the associated vaccinations will ultimately determine the timeline for the ending of the pandemic.

As of November 2021, there have been 24 approved vaccines, 155 vaccine candidates, and 495 vaccine trials for COVID-19 (McGill COVID19 Vaccine Tracker Team, 2021). Previous research has shown an increase in vaccine-preventable diseases in regions with a high vaccine refusal rate (Dror et al., 2020; Omer et al., 2009). Not only are vaccinated individuals directly protected against vaccine-preventable diseases, but those who do not get vaccinated are also possibly protected against the disease through the phenomena of herd immunity (Dubé et al., 2013). Herd immunity refers to the indirect protection of a community against the disease vaccinated for, due to slow transmission, reducing risk of infection in the community (Dubé et al., 2013; Fine et al., 2011). It has been suggested that in order to achieve herd immunity for COVID-19 in Canada, a population has to reach 70% immunization (Taylor et al., 2020; Fine et al., 2011) In this case, "population" refers to a specific community within a country or region, as people who tend to refuse vaccinations

are often found in clusters (Taylor et al., 2020). Approximately 75% of the entirety of Canada has been vaccinated (as of 9 November 2021) (Covid19tracker, 2021), and the Central Okanagan region in British Columbia stands at 83% (BCCDC, 2021).

"Vaccine hesitancy" refers to the reluctance of people to receive a safe and approved vaccine (MacDonald, 2015; Machingaidze & Wiysonge, 2021). Vaccine hesitancy lies in the middle of the continuum from complete vaccine acceptance and complete vaccine refusal (Freeman et al., 2020). Vaccine hesitancy and refusal could pose a serious threat to the success of any vaccination program (Dubé et al., 2013). Moreover, Freeman et al. (2020) found that vaccine hesitancy was associated with lesser compliance with public health guidelines, and a smaller likelihood of getting tested for the coronavirus despite experiencing symptoms. This is counterproductive to the objective of the guidelines, posing a threat to the attempts of containing the virus. Therefore, it is important to understand attitudes and beliefs that might contribute to vaccine beliefs and vaccine hesitancy.

According to Machingaidze and Wiysonge (2021), a common reason for vaccine hesitancy is concerns about the side effects of the vaccine (see also Robertson et al., 2021). One other reason for non-acceptance of vaccines could be belief in coronavirus and vaccine conspiracies. Conspiracy theories have been defined as explanations for important events using perceived secret plots (Bertin et al., 2020; Douglas et al., 2017). Not surprisingly, several conspiracy theories concerning the COVID-19 pandemic have been identified … Some conspiracy beliefs regarding the COVID-19 pandemic include: "COVID-19 is a bacteriological weapon used by the Chinese Communist Party to create panic in the west", "the coronavirus is a hoax". Similarly, conspiracies about the vaccines can look like: "Big Pharma created COVID-19 to profit from the vaccines", "The vaccine will be used to carry out mass sterilisation", etc. (Freeman et al., 2020). Researchers have found that stronger

endorsement of coronavirus and vaccine conspiracy beliefs are associated with higher levels of vaccine hesitancy (Bertin et al., 2020; Freeman et al., 2021).

Ever since the vaccine mandates and vaccine passports were introduced in British Columbia, many vaccine-hesitant individuals reported feelings of being “forced” to be vaccinated (NBC News, 2021). Further, through social media platforms such as TikTok, people have been persuaded to take actions to “neutralize the radioactivity in” vaccinations by taking baths in Epsom salt and baking soda (NBC News, 2021). Despite this being a relatively safe action, social media has proved its ability to instill fear and equip people with misinformation, which further destabilizes the attempts that are being made to communicate vaccine safety effectively.

Previous research and documentaries have found that social media contributes to the polarization of political opinions, causing more radical views in exchange for facts and science (Orlowski & Rhodes, 2020; Amer & Noujaim, 2019; Langlois, 2013). Further, it is possible to rapidly propagate fake news through social media. Vosoughi et al. (2018) defined fake news as false information that is presented as real news. Increasingly, fake news, through social media propaganda, has been targeting scientific topics (e.g., coronavirus and vaccine information) (Iyengar & Massey, 2019). News is often filtered and presented to users based on the type of content the user has engaged with in the past, creating “filter bubbles”. In this way, social media may contribute to political and scientific polarization by showing users what they will most likely engage with - news aligning with their already existing beliefs (Orlowski & Rhodes, 2020; Amer &Noujaim, 2019; Bolsen & Druckman, 2018; McCright et al., 2013). Vosoughi and associates (2018) found that fake news was so widespread that Twitter users retweeted false news more than they did real news, with the false news reaching more people than true news. Further, it was found that when fake news

articles from two opposing, but anonymous political leaders were read, individuals evaluated the leader with similar political ideology as being more truthful than the leader with political beliefs that were incongruent with their own (Jun et al., 2017). Thus, media consumption plays a significant role in affecting readers' political beliefs and attitudes. This, in turn, affects their beliefs in scientific phenomena, including the recent topics of the coronavirus and its vaccines.

Furthermore, information on social media is sometimes presented in a complicated manner, which ultimately confuses the average consumer (Machingaidze & Wiysonge, 2021). Furthermore, incomplete or misunderstood information being propagated as facts contributes to more misinformation, thereby creating a cycle of uncombated misinformation. Additionally, the media may focus on a limited number of perspectives about the vaccines, and they may present articles that are more likely to get clicks, such as the side effects and adverse effects caused by the vaccinations, which may inappropriately present vaccines as more dangerous than they really are. Despite this reliance on media, Machingaidze and Wiysonge (2021) reported that health care workers were reported to be the most trusted source of guidance about vaccines against COVID-19. However, various studies have found that many other factors also play a role in vaccine beliefs.

One other factor that could influence vaccine beliefs is political orientation. Taylor et al. (2020) indicated that previous studies have found that conservatives were more likely than liberals to oppose the COVID-19 vaccine (Angus Reid Institute, 2020 as cited in Taylor et al., 2020). Based on political ideology, people are popularly classified as 'left-leaning', if they have more liberal outlooks and cognitive styles, along with greater openness (Everett, 2013). 'Right-leaning' individuals are characterized by more conservative thinking styles, including more rigid and disciplined outlooks, and a greater need for order. Conservatism can be of

different types. For example, social (or cultural) and economic conservatism are two types of conservatism that have been identified and found to exist on distinct continuums (e.g., an individual can be an economic conservative and a social liberal, or vice versa). Social conservatism concerns the preservation of traditional culture and morality, and also includes religious beliefs as a basis for political orientation (Everett, 2013). Economic conservatism, on the other hand, refers to beliefs regarding government involvement and "regulation of private enterprise", all concerning the economic lives of the citizens (Everett, 2013, p. 1). Freeman et al. (2020) have found that more right-wing political views are associated with coronavirus conspiracy beliefs. This could be because individuals who are high in economic conservatism believe that industries are foundational for societal progress (Everett, 2013), and thus, they may be more reluctant to accept industry closures and lockdowns.

Another factor that is associated with political ideology, and thus vaccine beliefs is scientific outlook. There has been a significant increase in the politicization of science. That is, on average, scientific literacy varies as a function of political ideology (Zhou, 2016). One proposed explanation for this difference in scientific literacy among political groups could be due to the "framing" effect. Framing is when a message emphasizes one aspect of the issue, while completely ignoring another aspect, thus propagating incomplete and biased information (Chong & Druckman, 2007, as cited in Zhou, 2016). For example, it is possible that articles focusing on infringement of personal freedoms and autonomy may increase distrust in government guidelines, and a general distrust in vaccines. Framing, ultimately, affects public opinion on political and scientific issues. Since science has been politicized, this effect has been extended to a variety of scientific phenomena, including the coronavirus and its associated vaccines. In fact, this framing is so widespread and powerful in politics that it is one reason that partisans are more receptive to messages by a political party

congruent with their political ideology than to messages from the opposition, regardless of the content of the message (Cohen, 2003). Further, Zhou's (2016) research found that conservatives were, in fact, more assured in their beliefs after being exposed to framed articles, consistent with the "framing" effect hypothesis.

However, due to the different dimensions of political ideologies, it might be problematic to categorize all conservatives as less scientifically literate. For example, Carl et al. (2016) found that while individuals who identified as conservatives and social conservatives were likely to be less scientifically literate and trusting of science, they also found that economic conservatives were, in fact, more or equally scientifically literate and optimistic about science as economically left-leaning individuals (Carl et al., 2016).

In keeping with the above findings, McCright et al. (2013) proposed the "anti-reflexivity thesis." They hypothesized that conservatives would support certain types of sciences, one being "production science" (i.e., science that helps produce consumer materials), which improves the economy. Conversely, this thesis suggests that conservatives will be less supportive of "impact science" (i.e., science that identifies environmental and public problems due to economic production). It is possible that the topic of coronavirus might be perceived as a production science, where vaccine and disease-protective gear increase production. McCright and associates found that conservatives reported less trust in scientists in general, and less support for impact science than individuals who were more liberal. Moreover, conservatives trusted production science more than their liberal counterparts. Taken together, blanket statements regarding conservatives' scientific literacy and belief are problematic, and the type of conservatism that affects scientific literacy merits further exploration in order to better understand the relationship between scientific literacy, political ideology and COVID-19 attitudes and beliefs.

Current Study

This study was designed to evaluate the nature of individual differences regarding attitudes and beliefs about the coronavirus and its vaccines by considering general beliefs in conspiracies, social media consumption, political ideology, scientific literacy, and the inter-relations between these variables. Further, with respect to political ideology, given the polarization of beliefs based on political orientation, we considered how different dimensions of conservatism are related to scientific literacy, endorsement of COVID-19 policies and the perceived effectiveness of vaccines. It is also important to consider the role of social media in these relationships. Moreover, as most research has focused on the Republican-Democratic political system of the U.S, this study focused upon investigating the broader constructs of right-leaning vs. left-leaning political views along two dimensions of social and economic political views.

As this is a relatively new topic under investigation, we used a more exploratory method to evaluate the regression models. Some of our hypotheses evolved out of recent literature regarding this topic. First, it was predicted that right-leaning individuals would be more likely to endorse conspiracy theories, as suggested by Freeman et al. (2020). In addition, it was predicted that these individuals would be more opposed to the coronavirus vaccine, as suggested by Taylor et al. (2020) and the Angus Reid institute (2020). With regard to scientific literacy, it was predicted that individuals who were less scientifically literate would be more vaccine hesitant. It was also expected that conservatively oriented individuals would have a lower scientifically oriented outlook (including scientific knowledge, belief in science and trust in scientists) than individuals who were more liberally oriented. More specifically, social conservatives were predicted to have the lowest level of scientific literacy, relative to economic conservatives and their more liberal counterparts, as suggested by Carl et al. (2016). In addition, exploratory analyses were conducted to determine if the preferred media source was associated with endorsement of vaccine

hesitancy, political orientation, and scientific literacy. Additionally, the extent to which social media usage, political orientation, scientific outlook, and conspiracy mentality contribute to vaccine beliefs will be explored.

Methods

Participants

Participants (*N* = 864) were undergraduate students at UBCO. The participants primarily identified as female (66.9%). Just over 1% identified as non-binary or did not specify their gender. Majority of participants identified as White/European (59.4%), South Asian (14.9%) or Southeast Asian (14.9%). The mean age of participants was 20.4 years (SD = 6.6) but/and ranged from 17 to 44 years.

Participants were recruited using posters across the UBCO campus, where interested students could scan the QR code to enter the survey. Recruitment was also carried out through the UBCO Psychology Department's SONA system (see Appendix 1). SONA is UBC Okanagan's research participation system, where students can sign up to participate as subjects in research studies to gain bonus points towards their courses, if they choose to. For this study, participants received 1 SONA credit towards an eligible Psychology course, or they could choose to be entered into a draw for a $100 gift card. Further, since we were interested in social media usage as a factor, survey links were posted on various UBCO affiliated social media pages on Facebook, Instagram, Discord and Reddit. All participants were incentivized to participate in the study through a random draw for $ This research was reviewed by the UBCO Behavioural Research Ethics Board (H21-00645).

Measures

Personal Information Questionnaire (PIQ)

The PIQ was developed for the purposes of the current study (see Appendix 2). It was used to characterize the sample and to evaluate the nature of individual differences in beliefs concerning COVID-19 and associated vaccines. The questionnaire included standard socio-demographic questions (e.g., age, gender identity, and ethnicity) and additional

questions about academics (e.g., their program of study, degree year) and living situation (e.g., where they are currently living), program and year of study, international student status, country of residence, and work status.

Participants were also asked to report if they had ever contracted COVID-19 and their vaccination status. If not fully vaccinated, they were asked if they intended to get fully vaccinated. In addition, participants were asked to indicate/describe their primary reason for getting vaccinated.

COVID-19 Attitudes and Beliefs

Selected subscales of the Oxford Coronavirus Explanations, Attitudes and Narratives Survey (OCEANS II) (Freeman et al., 2020) were included in the present research. Freeman and associates (2021) created this measure by reviewing the relevant research to find measures previously used to assess various facets of an individual's attitudes and beliefs about COVID-19, COVID-19 vaccines, and vaccines in general.

COVID-19 Vaccine Beliefs. A subset of items from the OCEANS B (Freeman et al., 2021) was used to assess the degree to which participants were confident and accepting about the COVID-19 vaccines. The full scale consisted of 42 items. Only five of the items were judged to be relevant given the timing and Canadian context of the current research. Specifically, the items that addressed perceived vaccine safety, acceptance, and benefits were used. These items were rated on 5-point scales, with lower rating associated with greater COVID-19 vaccine confidence. Appendix 2 shows the items and their rating scales. Each item's rating scale varied as a function of the specific question A Principal Component Analysis with Varimax rotation on the five items yielded a single factor. Accordingly, the five

items were collapsed into a single score by calculating the total of all five items. The reliability of this measure was strong (α = .90).

OCEANS Coronavirus Conspiracy Scale (OCEANS L). The OCEANS L was used to evaluate general (OCEANS_L_B) and specific (OCEANS_L_S) COVID-19 conspiracy beliefs (Freeman et al., 2021). The OCEANS_L_B consisted of 7 items (e.g., "COVID-19 virus is a hoax") and the OCEANS_L_S (e.g., "COVID-19 is a bioweapon developed by China to destroy the West") consisted on 14 items. All items were rated on a 5-point rating scale of 1 (do not agree) to 5 (agree completely). Higher scores on these measures indicated greater endorsement of COVID-19 conspiracy beliefs. The reliability of the OCEANS_L_B (α = .90) was comparable to the reliability reported by Freeman et al. (2021) (α = .94). The OCEANS_L_S showed a high reliability as well (α = .90).

COVID-19 Beliefs Measure. The COVID-19 Beliefs Measure (Kleitman et al., 2021) consisted of 10 items that were rated on a 5-point rating scale of 1 (strongly disagree) to 5 (strongly agree). The items in this measure were adapted by Kleitman et al. (2021) from Fetzer et al. (2020). Based on Kleitman et al.'s (2021) study, the measure consisted of three subscales. The Perceived Benefits subscale evaluated the endorsement of strict COVID-related protective measures despite the costs of these strategies (e.g., "Risky behaviours, which might enable the spread of COVID-19, should be financially punished"). The second subscale, Response Efficacy, evaluated participants' beliefs about the effectiveness of the measures in slowing the spread of the coronavirus (e.g., "A flatter curve means less burden on the healthcare system"). Finally, the Perceived Barrier subscale

evaluated participants' beliefs about inconveniences and burdens caused by the COVID safety measures (e.g., "Social distancing will likely destroy our economy"). Each subscale score was separately calculated by averaging the scores of each item in that subscale. The reliability of the Perceived Benefits measure was somewhat higher (α = .78) than the reliability reported by Kleitman et al. (2021) (α = .70) while the reliability of the Response Efficacy scale was slightly lower (α = .68) than the reliability reported by the authors (α = .73). For the Perceived Barriers measure, the reliability (α = .59) was low, but was higher than reported by the authors (α = .47).

Political Orientation

Political Orientation Self-report. Participants were asked to describe their political orientation using a 10-point scale that ranged from 0 (very conservative) to 10 (very liberal). This question was adapted from … PEW …

Social and Economic Conservatism Scale (SECS). The SECS (Everett, 2013) consists of 12 politically pertinent concepts or issues. Conceptually, the scale consists of terms that reflect social (e.g., "religion") and economic (e.g., "military and national security") conservatism. Participants were asked to rate each item using a 100-point visual analog scale, such that 0 indicated a very negative view of the item and 100 indicated a very positive view of the item. Higher scores indicated greater conservatism. The overall scale showed a moderate internal consistency, α = .77, which was lower than the α = .88 reported by Everett (2013). Item 6 ("Gun Ownership") was dropped from the analysis as only 78% of

the sample answered this item when compared to the 92-98% response rate for the other items. A Principal Component Analysis (PCA) with Varimax rotation was conducted to determine if the 11 items tapped into the two dimensions of conservatism as suggested by Everett (2016). To determine the number of components, the scree plot, and Eigenvalues (i.e., > 1.0) were inspected. These indices suggested three components. However, an inspection of the rotated matrix revealed that only 2 items (Item 2 ("limited government") and Item 5 ("welfare benefits") loaded onto the third factor. Conceptually, it was not clear what the relationship between these two items reflected. In addition, given that this component consisted of fewer than the recommended minimum of four-item, it was dismissed. In addition, Item 11 ("The family unit") cross-loaded on Components 1 and 2 (i.e., difference between loadings was < .10).

Accordingly, a two-component model was tested. Item 2 ("Limited Government") was excluded as it did not sufficiently load onto either component (loading < .300). Item 7 ("Traditional marriage") was excluded as it cross-loaded onto both factors. All other items were found to load uniquely onto one of the two components (see Table 1). Inspection of the items on each component suggested that Component 1 reflected economic conservatism (SECS-E), and Component 2 reflected social conservatism (SECS-S). For data analysis purposes, scores for items on each subscale were averaged, creating one score for each factor/subscale. A higher score on the economic or social subscale meant a higher level of economic or social conservatism, respectively. Analysis of inter-item reliability using Cronbach's Alpha was $\alpha = .73$ for the economic subscale and $\alpha = .57$ for the social conservatism subscale. Since Everett (2013) included different items on each subscale, a comparison between the Cronbach's Alpha was not conducted.

Scientific Outlook

Belief in Science Scale. The Belief in Science Scale (BISS) (Farias et al., 2013) consists of 10 statements evaluating participants' belief science (e.g., "We can only rationally believe in what is provable"; see Appendix …). Participants rated each item on a scale of 1 (strongly disagree) to 6 (strongly agree). The mean of all items was calculated, and higher scores on this measure indicate greater belief in science. To determine inter-item reliability, Cronbach's alpha was calculated for all the items in a scale. The scale had high internal consistency (α = .91), which was the same as the internal consistency reported by Farias et al. (2013) (α = .88).

Scientific Knowledge. A measure of scientific knowledge developed by the National Science Board was used to assess scientific literacy (National Science Board in Sjøberg, 2014). The measure consisted of 14 general knowledge questions about science (e.g., "The sun goes around the earth") with response options of True or False. Items that had "False" as the correct answer were reverse coded. Correct answers were given a score of 1, and the total for the whole measure was calculated. Higher scores indicated greater scientific knowledge. However, for this measure, the internal consistency was low (α = .59).

Media Measures

Information Consumption Measure. The Information Consumption Measure (ICM) consisted of 4 subscales (Kleitman et al., 2021). The first scale ("Check News") consisted of a single item ("Currently, how often do you check the news regarding COVID-19?") rated on a scale of 1 (never) to 5 (multiple times a day).

The second scale ("News Sources") consisted of 8 different potential sources of COVID-19 information. Participants rated their usage of each item using a 5-point scale of 1 (never) to 5 (all of the time). Item 8 was an open-response option where participants could enter their most frequently used source of COVID-19 information. A principal component analysis of the first 7 items yielded 2 factors, as described by Kleitman et al. (2021). The first component consisted of Items 1, 5, 6, and 7 and was labelled "Casual sources," as suggested by Kleitman et al. (2021) (α = .75). Similarly, the second component was labelled "Official sources" and included Items 2, 3 and 4 (α = .83). The reliability of each subscales was somewhat stronger for our study than that reported by Kleitman et al. (casual (α = .66) and official (α = .74)).

The third scale of the ICM was termed "Source Check" and consisted of a single item ("How often do you check that the source of information about COVID-19 is legitimate/trusted?"). Participants rated the frequency that they check the source using a 5-point rating scale (i.e., 1 (never) to 5 (all of the time).

The last scale was termed "COVID-19 Information Source Trust" ("How much do you trust …as a source of information about COVID-19") and consisted of 3 items (scientists,

media, social circle). Participants indicated the extent that they trusted each source rated on a scale of 1 (strongly distrust) to 3 (strongly trust) (Kleitman et al., 2021).

Social Media Use Integration Scale. The Social Media Use Integration Scale (SMUIS) originally consisted of 10 items rated on a 6-point rating scale of 1 (strongly disagree) to 6 (strongly agree) (Jenkins-Guarnieri **et** al., 2013). However, our version was accidently a 7-point scale ranging from the same 1 (strongly disagree) to 7 (strongly agree). The measure assesses the degree of "engaged use" of various social media platforms in daily life (Jenkins-Guarnieri et al., 2013). Two subscales of this measure were used based on Jenkins-Guarnieri et al.'s study: 1) The "Social Integration and Emotional Connection" (SIEC) subscale (e.g., "I get upset when I can't log on to social media") and 2) " Integration into Social Routines" (ISR) subscale (e.g., "I enjoy checking my social media account"). The whole scale had high inter-item reliability (α = .89). The SIEC had a high reliability (α = .88) as well. The ISR had a moderate reliability (α = .74).

News Sources. We adapted measures from the PEW Research Centre's American Trends Panel surveys (PEW Research Center, 2021). One of the surveys we used evaluated participants' use of a variety of news sources on a 4-point rating scale of 1 (often) to 4 (never). Higher scores indicated less frequent use of that particular news source. Item 2 ("Social media (such as Facebook, Twitter, Instagram, YouTube, Reddit, etc.")) was of particular interest for this study.

We also used the PEW Research Centres' measure of reliance on social media as news sources. This measure asked participants if they used specific social media platforms for news, with a rating scale of 1 (Yes) or 0 (No). The number of "Yes" responses was

summed for each participant and used to estimate “Social Media Use”. Higher scores on this measure indicate a greater reliance on social media platforms as news sources.

We also used selected questions regarding perceived social media news accuracy (“I expect the news I see on social media will:” on a scale of 1 (largely be accurate) to 4 (largely be inaccurate)). This was followed by perceived social media news helpfulness (“Overall, would you say news on social media has” on a scale of 1 (Helped you to better understand current events) to 3 (Not made much of a difference)).

Procedure

The study consisted of a single online survey that was hosted by UBC Survey Tool (Qualtrics). Upon accessing the survey cited, interested individuals were presented with a detailed consent form, which described the purpose of the study, the eligibility criteria, what participation would involve, and pertinent ethical information that could influence their decision to participate (see Appendix …). If they proceeded to the survey, their consent to participate in the study was inferred.

The various measures were presented in a fixed order for all participants, as listed in Appendix 2. First, participants were directed to the PIQ. Next, they were administered the five items from the OCEANS B. Then, the Information Consumption Measure was administered, followed by the NSB’s Science knowledge measure. This was then followed by the Social Media Integration Scale, COVID Beliefs measure, PEW Research Center’s media measures, followed by the OCEANS L. The SECS was then administered, followed by the BISS. Upon completing the various questionnaires, participants were presented with additional information about the study and resources concerning COVID-19 information, COVID-19 vaccine information and articles about media misinformation. They were also presented with resources to help with fact-checking and for psychological well-being. All of the above

could be downloaded (see Appendix 2). Participants were then automatically directed to an independent Qualtrics survey site. Here, participants were asked to provide their contact information so that they could be assigned their SONA credit or be entered into the draw.

Study Design and Data Diagnostics

The study was designed to evaluate the inter-relationships between political ideology, scientific literacy, media use, and COVID-19 attitudes and beliefs and COVID-19 vaccine attitudes and beliefs. To be included in the final analyses, participants had to have completed all the measures that were analyzed in this part of the study. In addition, the acceptable number of items that a participant could omit from a measure was roughly no more than 10% of the total number of items in the measure. However, this varied according to the total number of items in the measure. If they omitted more, their data were omitted from all analyses. The data were also checked to determine if any specific item(s) of each measure were omitted by a large number of participants. With one exception (Item 6 of the SESC, as described above), there was no clear pattern in omissions for any of the measures. Additionally, if there were very few missing values for a participant in a measure, the missing item scores were replaced by the participant's mean on that measure

A total of 178 participants were omitted from all analyses in this part of the study and are not included in the sample size mentioned. Thirteen participants did not complete the BISS while the other remaining participants did not complete a major part of the study or did not complete the PIQ. For all other omitted responses in any measure, the missing values were replaced by the participant's mean for that measure.

Analytic Strategy

For the remaining 864 participants, descriptive analyses were conducted for all the measures in order to characterize the sample. To determine if the political orientation, SECS,

NSB, BISS, media measures and COVID attitudes and beliefs and COVID Vaccine attitudes and beliefs were inter-correlated, a series of bivariate correlations using Pearson's *r* was conducted. We will then possibly run a regression analysis for vaccine beliefs and COVID-19 conspiracy beliefs as a dependent variable based on the results of the correlational analysis.

Results

Characterizing the Sample

The sample consisted of 35% first-year students, 23.2% second-year students, 21.4% third-year students, 17 % fourth-year students, and 3.4% fifth-year students at UBCO. Our sample comprised 87.7% from the central Okanagan region, 4.1% from elsewhere in British Columbia, and 3.5% from outside of Canada.

At the time of participation, 87.8% of the sample had not contracted COVID-19 while 11% reported having contracted COVID-19 at some point. Regarding vaccination, 94.8% of participants were fully vaccinated, 1.5% were partially vaccinated, and 2.4% were unvaccinated. Of those who were either partially vaccinated or unvaccinated, 29.4% did not intend to get fully vaccinated. With regards to reasons for getting vaccinated, of the participants who were vaccinated (i.e., partially or fully) or who intended to get fully vaccinated, most participants reported that the primary reason was to protect the people and the community around them, or that it was to protect themselves against the COVID-19 (see table 2).

According to the Political Orientation Self-Report Measure, participants were, on average, more liberal than conservative as indicated by the one-sample *t*-test (using the score 5 for “centrist” orientation as the test value) ($t(844) = 18.69$, $p = < .001$). Substantive variability in responses was, however, evident. Moreover, the distribution was not skewed.

To further determine the political orientation of the sample, the Social and Economic Conservatism Scale scores were examined. The minimum and maximum scores showed that

there were extreme scores on both sides, which balanced the sample mean roughly in the middle (see Table 4). The responses were not particularly skewed, and about 48.3% of the sample was more liberal leaning (i.e., had a score lower than 50). However, considering the subscales, participants, on average, were more economically conservative as indicated by the result of the one-sample *t*-test (using a "centrist" score of 50 as the test value) ($t(802) = 20.20$, $p = < .001$) and less socially conservative ($t(795) = -13.41$, $p = < .001$). The distributions of the SECS Economic Conservatism and the SECS Social Conservatism scores were not particularly skewed (see Table 4).

The mean of the Scientific Knowledge (NSB) measure indicated that, on average, participants had good general knowledge about basic scientific phenomena. The measure was negatively skewed indicating that most people scored higher on this measure. A total of 17.7% of participants answered every question correctly. In addition, every participant answered at least four of the 14 questions correctly. For the Belief In Science Scale, participants, on average, had a slightly higher scientific belief in daily life. Moreover, the distribution of scores was not particularly skewed. Nonetheless, variability on both these measures was acceptable.

As for the "Social Media Total" measure, the sample used, on average, 3 social media platforms to receive news. On the SMUIS, the averages for each subscale indicated that the sample had somewhat integrated social media into their daily life, with Integration into Social Routines being more prominent than Social Integration and Emotional Connection to social media. The sample was not skewed for this measure. As for Perceived Social Media News Accuracy, 50.8% of participants thought the news to be somewhat or largely accurate, while 49.2% thought it to be somewhat or largely inaccurate. The sample was distributed normally. As for the Perceived Helpfulness of Social Media News, 47.9% of the sample

reported that social media helped them better understand current events. However, 22.3% thought that social media news confused them about current events, and 29.7% thought that social media news made no difference to them. For the COVID-19 Information Source measures, approximately 34% of participants reported getting information about COVID-19 "most of the time" or "all the time" from social media. The distribution for this measure was not skewed.

As for the Vaccine Beliefs measure, on average, participants had confidence in the COVID-19 vaccines and were accepting of them (see Table 3). Moreover, the distribution of scores was highly positively skewed, indicating that overall, the sample showed more acceptance of the COVID-19 vaccines, and less uncertainty about them.

As for COVID-19 Information Source Trust, on average, participants trusted scientists for their COVID-19 information. Only 9.4% rated a score of 3 ("About half of the time") or less ("sometimes" or "never") on this measure, indicating that only a small percentage of the sample did not fully trust information about COVID-19 coming from scientists.

Additionally, on average, participants did not endorse COVID-19 conspiracy thinking, as assessed by the General and Specific COVID-19 Conspiracy Theories subscales of the OCEANS L. Responses to both subscales were very positively skewed. The frequency distribution for the broad conspiracy scale showed that 95.1% of the sample had a score of 3 or below, with 86.9% having a score of 2 or below, revealing that most of the sample did not endorse COVID-19 conspiracy thinking. The frequency distribution of the specific conspiracy scales revealed that 98.1% of the sample had a score of 3 or below, again indicating that the current sample either did not agree or agreed slightly with specific COVID-19 conspiracy theories. Due to the skewness of the data, this measure was excluded from any analyses.

As for the general conspiracy theory measure (OCEANS M), the mean score indicated a slightly more conspiracy-based view of the world. The distribution of scores was not skewed on this measure. Around 62.7% of the sample had a score greater than 5, indicating that there was sufficient variability in responses.

Understanding individual differences in beliefs about COVID-19 vaccines.

To evaluate the correlations between vaccine beliefs, as assessed by the Vaccine Beliefs measure (OCEANS B), and political ideology, bivariate correlations using Pearson's *r* were conducted (see Table 5). As shown, vaccine hesitancy was associated with higher levels of conservatism, especially with social conservatism. There was a significant difference between vaccine beliefs of social and economic conservatives, with social conservatives having more uncertainty about the COVID-19 vaccines (z = -4.41, p = .00). Similar direction of relationship was observed with the Political Ideology Self-Report measure as well, where higher scores indicated more liberal outlooks. Thus, more conservative political ideologies were associated with greater COVID-19 vaccine hesitancy. More specifically, social conservatism was more associated with these vaccine uncertainties. Furthermore, vaccine hesitancy was significantly and inversely correlated with scientific knowledge, belief in science and trust in scientists as a source of COVID-19 information (see Table 5). That is, greater scientific knowledge and greater beliefs in science were associated with more positive beliefs about the COVID-19 vaccines. Thus, poorer outlooks about science may be associated with vaccine hesitancy.

Interestingly, conservative political orientations were correlated with all scientific outlook measures (see Table 5). This suggests that more politically conservative orientations are associated with less Scientific Knowledge, Belief in Science, and Trust in Scientists as a Source of COVID-19 Information. However, based on the Social and Economic Conservatism

Scale, there was a stronger correlation between social conservatism and lower scientific knowledge and belief in science. There was a significant difference between the correlations of social conservatism with scientific knowledge and economic conservatism with scientific knowledge (z = 5.93, p = .00). Similarly, there was a significant difference in correlations of Social Conservatism with Belief in Science and Economic Conservatism with Belief in Science (z = 7.67, p = .00). This means that there was a stronger association between social conservatism and poorer scientific outlook than economic conservatism and poorer scientific outlook. In addition, both social and economic conservatism, as assessed with the SECS, were associated with stronger endorsement of general conspiracy theories (i.e., OCEANS M scores).

The inter-correlations between beliefs about COVID-19 vaccines and social media use are presented in Table 6. It was found that higher vaccine uncertainty was slightly correlated with Social Media Use Integration into daily life, and with the integration into social routines subscale. It was also found that higher vaccine uncertainty was weakly correlated with perceived social media news accuracy, perceived social media news helpfulness, and getting COVID-19 information from social media.

Table 7 shows the inter-correlations between the various predictor variables. As we can see, conservatism was inversely correlated with checking if the COVID information being consumed was accurate. That is, less conservative individuals tended to evaluate the accuracy of COVID-19 news they were consuming. Further, all scientific outlook measures were correlated with checking COVID-19 news legitimacy, meaning that more scientifically oriented individuals checked if the COVID-19 news they were consuming was accurate. Further, belief in science was associated with social media integration into daily life. This

showed that stronger beliefs in science were associated with more social media integration into daily life.

Taken together, it is evident that COVID-19 Vaccine Beliefs are associated with a diverse array of variables. To better understand the nature of these inter-relationships, a hierarchical multiple regression analysis was conducted. Predictor variables were entered such that they were significantly correlated with vaccine beliefs, but not strongly correlated with other predictor variables.

The steps of the model were entered using the following variables:
Block 1: Political ideology (self-reported, SECS-Soc and SECS-eco), Block 2: Scientific outlook (Trust in Scientists as a source of COVID info, BISS and NSB), Block 3: Social media measures (COVID-19 Information Source "News sources" item 7 (social media), Social Media Total and SMUIS ISR).
The variables within each block were analysed using the "enter" method. Tests for assumptions regarding independence of residuals, linearity of relationships, collinearity of predictors, normality of residuals, homoscedasticity of errors, and outliers were run.

The results for hierarchical multiple regression for the OCEANS B measure (Vaccine Beliefs) is presented in Table 8. As predicted given the bivariate correlations, the social media variables accounted for a significant, albeit small, amount of the variance in vaccine beliefs (see Model 1 in Table 8). Addition of the three measures of political orientation (see Model 2) improved the overall model as the R^2 value increased. Additionally, inclusion of the three measures of scientific outlook (Model 3) and the general conspiracy belief measure (Model 4) improved the model further. However, political orientation gave the largest R^2 change. All four models were statistically significant, and the step 4 model was significantly better than the baseline model.

Taken together, social media usage, political orientation, scientific outlook, and conspiracy mentality are all associated with vaccine beliefs, and they roughly explained half of the variance in vaccine beliefs.

Discussion

This study aimed to explore the factors that contributed to attitudes and beliefs about COVID-19 and its associated vaccinations. Most of our participants were fully vaccinated, and endorsed getting the COVID-19 vaccine. They also had lower beliefs in COVID-19 conspiracy theories. As extreme anti-vaccination attitudes were not observed in many participants, exploring extreme attitudes could not be carried out using the current sample. As hypothesized, more conservative individuals were found to be more uncertain about COVID-19 vaccines (i.e., encouraging others to receive vaccinations, or with receiving booster doses every year if required). These results were also in accordance with Taylor et al.'s (2020) report about more conservative individuals opposing the COVID-19 vaccines. Additionally, social conservatism was found to be more strongly associated with these vaccine beliefs than economic conservatism. Although the differences in correlations of the Vaccine Beliefs measure with economic and social conservatism were small, these differences were significant. Thus, social conservatism was more associated with COVID-19 vaccine uncertainty than economic conservatism. Thus, economic conservatives were not largely more likely to refuse COVID-19 vaccines than the more economically liberal individuals in our sample, supporting McCright et al.'s (2013) "anti-reflexivity" theory. This is also supported by the lack of correlation between the Scientific Knowledge scale (NSB) and the SECS-E, and the very low correlation between the BISS and the SECS-E. Here as well, social conservatives showed significantly poorer scientific outlooks than economic conservatives. This result is in accordance with our hypothesis and with Carl et al.'s (2016) finding that economic conservatives were more optimistic and accepting of science than social conservatives. Additionally, following this theory, higher social conservatism was associated with less scientific knowledge and lower beliefs in science, thus supporting our

hypotheses. These results help narrow down the exact political attitudes that are associated with vaccine uncertainty, which could contribute to research to depoliticize scientific information.

Further, as expected, higher scientific outlooks were associated with more pro-COVID-19 vaccine attitudes. That is, more scientific knowledge, belief in science and especially trust in scientists as a source of COVID-19 information were associated with less vaccine uncertainty. In contrast, those who had endorsed conspiracy-oriented views about the world expressed more uncertainty about the COVID-19 vaccine. COVID-19 vaccine uncertainty was also associated with beliefs in both broad and specific COVID-19 conspiracy beliefs, which is congruent with the findings of Bertin et al. (2020) and Freeman et al. (2020). Thus, for COVID-19 conspiracy theories specifically, our hypothesis that more conservative individuals would endorse COVID-19 conspiracy theories to a greater degree was supported. Overall, it is evident from these results that scientific outlook plays a crucial role in vaccine beliefs and conspiracy thinking.

With regard to social media use, the number of social media platforms used was not associated with COVID-19 vaccine beliefs. Surprisingly, the more information individuals received from social media, the less uncertain they were about COVID-19 vaccines. These results may reflect the fact that most of our participants were young adults, and might have higher social media literacy than other age groups. It is possible that their ability to spot misinformation protected them from false COVID-19 vaccine beliefs. Additionally, our study found that more perceived accuracy of social media news was associated with more vaccine uncertainty. This may be due to the misinterpretation of misinformation on social media as real news. Also, perceived accuracy of COVID-19 misinformation on social media might contribute to the uncertainty due to conflicting news posts. This makes sense according to

Vosoughi and associates' (2018) findings that misinformation was widespread on social media such as twitter. Moreover, our study found that more integration of social media into daily routines (SMUIS-ISR), and more emotional connection (SMUIS_SIEC) through social media was slightly correlated with lower vaccine uncertainty.

As for social media use and COVID-19 conspiracy theory beliefs, the results indicated that the more social media platforms are used to access news the more they endorsed of COVID-19 conspiracy beliefs. This is consistent with Machingaidze & Wiysonge's (2021) findings that uncombated misinformation on social media can confuse the audience about accurate information. Furthermore, the less often that individuals checked to see if the news they were receiving was accurate, the more likely they were to believe in COVID-19 conspiracy beliefs.

As social media use was linked with more conspiracy thinking, but not with vaccine uncertainty, it is worth considering that many social media platforms have been providing links to official health organisation websites on every post about COVID-19 and its vaccines. This might have helped combat some misinformation, thus reducing vaccine uncertainty in those who used social media platforms more. This may also be the reason that individuals who did not check the legitimacy of the news they were consuming (perhaps by using these links) were more prone to believing COVID-19 conspiracy theories.

The results of the hierarchical multiple regression for COVID-19 vaccine beliefs demonstrated that social media, political ideology, scientific outlook and conspiracy mentality all significantly play a role in COVID-19 vaccine beliefs. The results also highlight the role that political ideology may play in scientific beliefs, as previously suggested by Zhou (2016), Cohen (2003), Carl et al. (2016) and McCright et al. (2013).

A strength of our study is that we concurrently evaluated many factors that are thought to underlie the polarization in COVID-19 and COVID-19 vaccine attitudes and beliefs. We managed to apply factors that contribute to the already existing polarization in scientific beliefs (such as conservative outlooks on topics such as climate change etc.) to the current COVID-19 pandemic. In addition to results that are supported by previous research, our study also found a correlation between checking news credibility and more liberal political views. Checking the legitimacy of COVID-19 news was also associated with higher scientific knowledge and trust in scientists. These correlations are foundational for future studies which could explore possible causal links vaccine beliefs and COVID-19 conspiracy beliefs. This current study helps fill the gaps in literature about the different factors that contribute to polarization. Additionally, the results of our hierarchical regression model supports the claim that many factors contribute to polarizations in COVID-19 vaccine beliefs. The politicization of scientific topics is highlighted by the result that around one-fourth of the variance in vaccine beliefs is explained by political ideology.

Limitations

As our sample consisted only of university students, the findings may not be generalizable. That is, there might have been differences in political ideology, social media literacy and scientific beliefs when compared with the general population. Additionally, social desirability in responding may have played a role in our responses as we did not include measures to control for these types of responses. Specifically, our measures of checking legitimacy of COVID-19 information, COVID-19 vaccine beliefs, COVID-19 conspiracy beliefs and conspiracy mentality might have been affected by this bias as participants may have believed that there was an ideal response to these measures.

It is also important to acknowledge that this research took place just before the surge of the Omicron variant in Canada when vaccines were already widely available. Thus, there may have been a lull in perceived importance of COVID-19 vaccines due to another surge during large vaccine availability. Additionally, the perceived lower severity of the Omicron variant might have contributed to different attitudes about the COVID-19 vaccine. Fatigue from the pandemic policies might have also affected responses on our different measures. Additionally, our sample had a high vaccination rate. The high vaccination rate could have been due to mandates at the UBCO campus, and thus, participants' real acceptance towards the vaccine might not have been reflected by their vaccination status.

Future directions

Using the data from the current study, additional regression models can be run to check for mediators and moderators in vaccine beliefs. Moreover, using the other measures that were included in our survey, more variables can be considered to explain vaccine beliefs. As a part of the larger study, we also collected data from the Central Okanagan community. Analysis of this data can be used to address any differences in attitudes and beliefs when compared to our university sample (that were on the younger side).

Further, assessing attitudes in various communities in Canada can help understand the influence of the different government policies that are in place across Canada on COVID-19 attitudes and beliefs. The results can then be expanded to different countries to study cultural influences in attitudes and beliefs about COVID-19. From this, attitudes and beliefs about more scientific topics can be examined using similar predictors. In order to understand the belief of fake news on social media, manipulations can be used where participants are exposed to fake and real news articles based on their political ideology in order to understand causal relationships (if any) for belief in misinformation. Ultimately,

studies can be conducted to explore ways to improve scientific and media literacy and scientific communication about topics of public safety.

Summary

Thus, this study found that conservatism, specifically social conservatism, has a significant role in vaccine beliefs. As expected, greater scientific outlook also plays a role in vaccine beliefs. Social media use was also associated with vaccine beliefs, but in conflicting ways. While more social media platform usage was associated with lower COVID-19 vaccine uncertainty, more integration of social media into daily life was associated with more COVID-19 conspiracy thinking. Thus, social media factors should be explored further in samples with different age groups. Lastly, conspiracy mentality was also associated with vaccine beliefs. Since the predictor variables of political ideology, scientific outlook, social media use and conspiracy mentality are all correlated, the exact causal nature or the role of any mediator/moderator influences on vaccine beliefs are still unknown and should be explored further.

Table 1

Principle Component Analysis for the Item Loadings of the SECS

Item	Item loadings	
	Component 1 (Economic conservatism)	Component 2 (Social conservatism)
10: Business	**.74**	.01
9: Fiscal Responsibility	**.70**	-.16
11: Family Unit	**.62**	.27
3: Military and National Security	**.62**	.16
12: Patriotism	**.55**	.44
7: Traditional Marriage*	.50	.49
2: Limited Government**	.25	-.003
1: Abortion	-.07	**.76**
8: Traditional values	.46	**.66**
5: Welfare Benefits	-.23	**.58**
4: Religion	.34	**.50**

Note. Extraction method: Principal Component Analysis with Varimax (orthogonal) rotation. Items are forced into 2 components. Bolded loadings indicate the component to which the item belongs. *Items excluded due to cross-loading. **Items excluded due to lack of loading onto either factor.

Table 2.

Frequencies Table of Reasons for Getting Vaccinated

Measure	Frequency	Percentage endorsed
To protect myself against COVID-19	299	35.8
To protect my community and people around me	384	46
I want to be able to get a vaccine passport so that I can go to restaurants and bars/nightclubs and take part in other "non-essential services"	61	7.3
I want to be able to travel	41	4.9
It was necessary/required for my workplace	15	1.8
Other	35	4.2

Table 3. *Descriptive Statistics of the COVID-19 related Measures*

Measure	N	Mean	*S.D.*	Minimum	Maximum	Skewness
OCEANS B	864	8.97	3.73	5.00	25.00	1.31
COVID-Beliefs	864	2.90	0.48	1.00	5.00	-0.21
COVID-Beliefs (Protective Behaviors)	864	2.68	0.91	1.00	5.00	0.06
COVID Beliefs (Response Efficacy)	864	3.84	0.79	1.00	5.00	-0.83
COVID Beliefs (Perceived Barriers)	864	2.26	0.83	1.00	5.00	0.49
OCEANS L B	863	1.40	0.66	1.00	5.00	2.21
OCEANS L S	859	1.16	0.41	1.00	5.00	4.28

Note. * $p \leq .05$; ** $p \leq .001$. OCEANS B = Vaccine Beliefs. OCEANS L B = COVID-19 Broad conspiracy beliefs. OCEANS L S = COVID-19 Specific conspiracy beliefs.

Table 4. *Descriptive Statistics of the other Measures*

Measure	N	Mean	S.D.	Minimum	Maximum	Skewness
Political Self-Report	845	6.38	2.15	0	10	-0.25
SECS-E	803	61.09	15.56	0.00	100.00	-0.19
SECS-S	796	42.08	16.66	0.00	96.36	0.16
BISS	861	3.89	1.06	1.00	6.00	-0.22
NSB	848	11.56	2.02	4.00	14.00	-0.82
SMUIS-SIEC	864	3.62	1.38	1.00	7.00	0.31
SMUIS-ISR	864	4.79	1.23	1.00	7.00	-0.56
Trust in Scientists	864	4.54	0.73	1	5	-1.67
COVID info source-SM	864	2.82	1.24	1	5	0.14
Social media total	864	3.27	1.96	0	11	0.76
Perceived SM accuracy	864	2.55	0.74	1	4	0.27
Perceived SM helpfulness	864	1.82	0.86	1	3	0.36

*Note. * $p \leq .05$; ** $p \leq .001$.* Political Self-Report= Political Self-Report measure. SECS-E = SECS economic subscale. SECS-S = SECS Social subscale. BISS = Belief in Science Scale. NSB = National Science Board Scientific Knowledge measure. SMUIS-SIEC = SMUIS Social Integration and Emotional Connection. SMUIS-ISR = SMUIS Integration into Social Routines. Trust in scientists = Trust in scientists as a source of COVID information. COVID info source-SM = COVID information received from social media. Social media total = Total number of social media sites used for news.

Table 5

Bivariate Correlation Matrix for Vaccine Hesitancy, Political Ideology & Scientific Outlook

	OCEANS B	SECS-E	SECS-S	Political Self-report	NSB	BISS
SECS-E	.20**					
SECS-S	.36**	.45**				
Political Self Report	-.41**	-.34**	-.48**			
NSB	-.15**	-.06	-.26**	.17**		
BISS	-.30**	-.09*	-.35**	.19**	.20**	
Trust in Scientists	-.54**	-.10**	-.30**	.26**	.21**	.25**
OCEANS M	.31**	.25**	.20**	-.07	-.13**	-.16**
OCEANS L Broad	.46**	.18**	.28**	-.21**	-.22**	-.14**

Note. * p ≤ .05; ** p ≤ .001. SECS-E = SECS economic subscale. SECS-S = SECS Social conservatism. Political Self-Report = Political ideology self-report scale. NSB = National Science Board Scientific Knowledge measure. BISS = Belief in Science Scale. Trust in scientists = Trust in scientists as a source of COVID information. OCEANS M = General conspiracy beliefs. OCEANS L Broad = COVID-19 Broad conspiracy beliefs.

Table 6

Bivariate Correlation Matrix for Vaccine Hesitancy and Social Media Use & Preferences

	OCEANS B	SM (COVID)	SMUIS-SIEC	SMUIS-ISR	SM Tot	SM Acc.
SM (COVID)	-.19**					
SMUIS-SIEC	-.08*	.35**				
SMUIS-ISR	-.10**	.32**	.64**			
SM Tot	.00	.38**	.30**	.26**		
SM Acc.	.12**	-.33**	-.26**	-.19**	-.26**	
SM Help	.09**	-.32**	-.22**	-.18**	-.22**	.39**

Note. * $p \leq .05$; ** $p \leq .001$. SM (COVID) = COVID information received from social media. SMUIS = Social Media Use Integration Scale. SMUIS-SIEC = SMUIS Social Integration and Emotional Connection. SMUIS-ISR = SMUIS Integration into Social Routines. SM Tot = Total number of social media sites used for news. SM Acc. = Perceived social media news accuracy. SM Help = Perceived social media news helpfulness.

Table 7

Bivariate Correlations for Political Ideology, Scientific Outlook and Social Media Use & Preferences

	SM (COVID)	SMUIS	SMUIS-SIEC	SMUIS-ISR	SM Tot	SM Acc.	Checking legit.
SECS	.05	-.03	-.06	.04	.10**	-.03	-.17**
SECS-E	.05	.02	-.03	.09**	.08*	.01	-.11**
SECS-S	.06	-.03	-.05	.02	.10**	-.004	-.18**
Self-report	.02	.03	0.04	.01	-.03	-.02	.16**
NSB	-.13**	-.06	-.05	-.05	-.20**	.14**	.24**
BISS	-.02	.15**	.17**	.08*	-.02	-.04	.12**
Trust Scientists	.03	.07	.03	.12**	-.04	.02	.20**
OCEANS M	.13**	.04	.05	.02	.17**	-.04	-

Note. * p ≤ .05; ** p ≤ .001. SECS = Social and Economic Conservatism Scale. SECS-E = SECS economic subscale. SECS-S = SECS Social conservatism. Self-report = Political ideology self-report scale. NSB = National Science Board Scientific Knowledge measure. BISS = Belief in Science Scale. Trust scientists = Trust in scientists as a source of COVID information. OCEANS M = General conspiracy beliefs. SM (COVID) = COVID information received from social media. SMUIS = Social Media Use Integration Scale. SMUIS-SIEC = SMUIS Social Integration and Emotional Connection. SMUIS-ISR = SMUIS Integration into Social Routines. SM Tot = Total number of social media sites used for news. SM Acc. = Perceived social media news accuracy. SM Help = Perceived social media news helpfulness. Checking legit. = Checking if COVID news being consumed is legitimate.

Table 8

Hierarchical Regression Results for Vaccine Beliefs

Variable	*B*	95% CI for *B*		*SE B*	R^2	ΔR^2
		LL	*UL*			
Step 1					.03	.03
Constant	9.48***	7.75	11.22	.88		
SMUIS- ISR	-.27*	-.50	-.04	.10		
SM Acc.	.54*	.13	.91	-.05		
SM (COVID)	-.15	-.38	.10	-.09		
Step 2					.24	.20
Constant	10.19***	7.95	12.34	1.12		
SMUIS- ISR	-.24*	-.44	-.03	.11		
SM Acc.	.58*	.22	.92	.18		
SM (COVID)	-.17	-.38	.05	.11		
Self-report (poli)	-.52***	-.64	-.38	.07		
SECS-E	.01	-.01	.02	.01		
SECS-S	.05***	.03	.07	.01		
Step 3					.41	.19
Constant	21.35***	18.70	23.97	134.		
SMUIS- ISR	-.05	-.24	.13	.09		
SM Acc.	.58***	.26	.88	.16		
SM (COVID)	-.19*	-.37	-.001	.10		
Self-report (poli)	-.39***	-.50	-.27	.06		
SECS-E	.01	-.004	.03	.01		
SECS-S	.02	-.002	.03	.01		
NSB	-.002	-.12	.11	.06		
Trust in Scientists	-2.18***	-2.48	-1.86	.16		
BISS	-.47***	-.69	-.25	.11		
Step 4					.45	.03
Constant	18.87***	13.88	19.31	1.38		
SMUIS- ISR	-.03	-.01	-.21	.14		
SM Acc.	.57***	.11	.27	.86		
SM (COVID)	-.25**	-.08	-.43	-.07		
Self-report (poli)	-.42***	-.22	-.50	-.28		
SECS-E	.002	.01	-.01	.02		
SECS-S	.01	.04	-.01	.02		
NSB	.02	.02	-.08	.14		
Trust in Scientists	-1.99***	-.33	-2.00	-1.38		
BISS	-.42***	-.12	-.65	.24		

Variable	*B*	95% CI for *B*		*SE B*	R^2	ΔR^2
		LL	*UL*			
OCEANS M	.37***	.11	.10	.35		

Note. CI = confidence interval; *LL* = Lower Limit; *UL* = Upper Limit; *p <.05. **p < .01. ***p < .001. SECS-E = SECS economic subscale. SECS-S = SECS Social conservatism. Self-report = Political ideology self-report scale. NSB = National Science Board Scientific Knowledge measure. BISS = Belief in Science Scale. Trust in scientists = Trust in scientists as a source of COVID information. OCEANS M = General conspiracy beliefs. SM (COVID) = COVID information received from social media. SMUIS-ISR = SMUIS Integration into Social Routines. SM Acc. = Perceived social media news accuracy.

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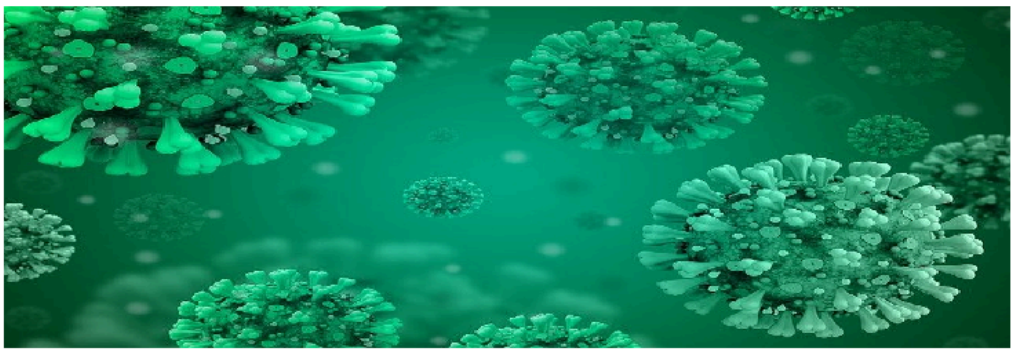
Appendix 1: Recruitment material

Figure 1

Poster 1

THE UNIVERSITY OF BRITISH COLUMBIA



DIFFERING OPINIONS: COVID-19

Participants needed!

You are invited to take part in a study about people's attitudes and beliefs about COVID-19 and the COVID-19 vaccines. You are asked to complete an online survey that will take 30-45 minutes to complete.

You must be a UBCO student to participate.

Participants can enter a draw for one of two $100 gift cards OR, if eligible, receive 1 Psychology SONA credit.

Scan the QR code below for more information or to participate.

https://ubc.ca1.qualtrics.com/jfe/form/SV_0wvGiJvH9eHjOho

For more information about this study, please contact Dr. Carolyn Szostak (Psychology): 250-807-8736 or carolyn.szostak@ubc.ca.

Figure 2

Poster 2

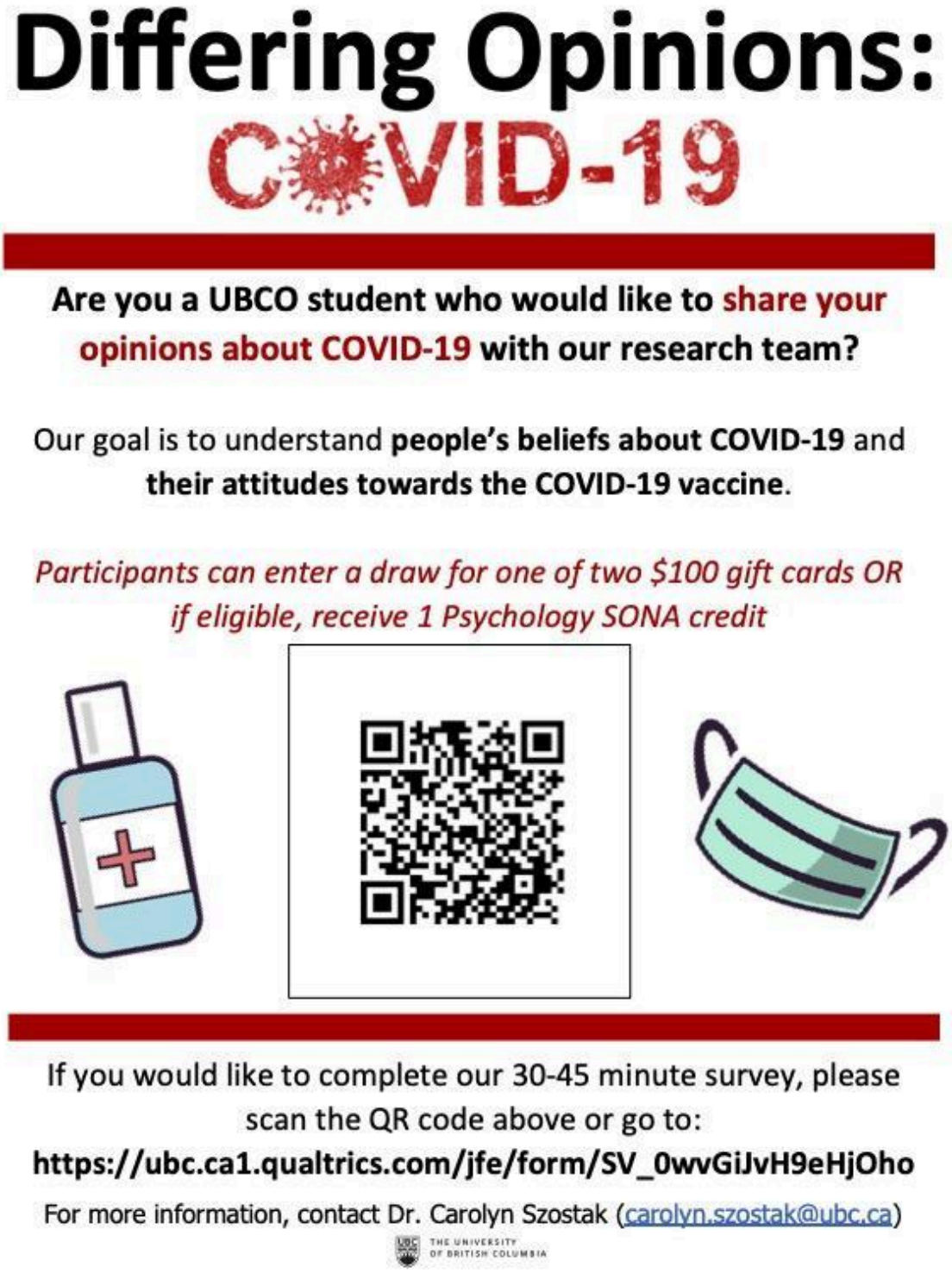


Figure 3

Description of the study that was posted ON SONA

Description to be posted on SONA

The following is the information that will be posted on SONA, the Psychology Department's web-based Volunteer Subject Pool. Please note that only students registered in some Psychology courses (i.e., those offered by instructors who provide marks for participating in research or completing an alternate task) have access to SONA. Upon accessing SONA, students can review brief descriptions of on-going studies involving human participants. SONA also provides information on how to contact the researchers for additional information about the study.

SONA Description

Short name (displayed on list of all studies): Individual differences (COVID-19 vaccines)

Study name: Understanding people's attitudes and beliefs about COVID-19 vaccines

Abstract: This study is about understanding individual differences that correlate to COVID-19 attitudes and beliefs, and vaccine hesitancy.

Description: The purpose of this study is to understand individual differences in people's attitudes and beliefs about COVID-19 and the available vaccines for this virus. Specifically, the inter-relationships between vaccine hesitancy in general, belief in COVID-19 & vaccine conspiracies, political orientation, scientific literacy, and media (with an emphasis on social media) uses and preferences with attitudes about COVID-19 and COVID-19 vaccines will be evaluated.

This study is an online study. The survey will take you between 30 and 60 minutes to complete. The survey will include questions about your socio-demographic background (e.g., your age, gender etc.). Answers to these questions will help us understand who took part in the research. We will also ask questions about your COVID-19 vaccine status and previous COVID-19 infection, if any. Finally, you will be asked a series of questions designed to assess your attitudes and beliefs about COVID-19, vaccines, political view, science, and media use. You will receive 1 SONA (online) credit, **OR** you will be entered in a draw for one of five $100 Amazon gift cards or e-transfer.
To access this survey, please click on the link provided below. (Note: please ensure that your email address is linked to your SONA account so that you can be sent a reminder to complete this survey if needed. We may also email you if you win the draw for the gift card or e-transfer).

We ask that once you start the survey, please complete it all at once. While you can take brief breaks, you cannot save your responses and return to it later. Instead, each survey will close automatically after 2 hours.

Figure 4

Message to social media pages requesting to post study poster

THE UNIVERSITY OF BRITISH COLUMBIA

Hello,

We are conducting a study entitled, *Differing opinions: Understanding people's attitudes and beliefs about COVID-19 vaccines.* The purpose of this study is to understand the differences in people's attitudes and beliefs about COVID-19 and the available vaccines for this virus. We are recruiting people who live in the Central Okanagan region (Kelowna, Lake Country, West Kelowna, Peachland, and surrounding communities) to complete an online survey. We are trying to recruit a diverse group of participants in order to capture the diversity of opinions and beliefs that exist. To this end, we are asking a number of social media forums whose membership includes people from the Central Okanagan region to either post our recruitment ad (see attached) on your site or to allow us to post it.

If you could let us know if this is possible, we would greatly appreciate it. If you need further information about the study or have any questions about our request, please contact Carolyn Szostak, the lead investigator, by phone 250-807-8736 or by email: carolyn.szostak@ubc.ca.

Kind regards,

Carolyn Szostak (Associate Professor)
Dyuthi Dinesh (Honours student)
Kevara Brody (Undergraduate student)
Gloria Cho (Graduate student)

Department of Psychology
IK Barber School of Arts & Social Sciences
University of British Columbia | Okanagan
Kelowna, BC

Appendix 2: Survey

Table of Contents

Differing opinions: COVID-19 (UBCO)

Consent form

Differing opinions: Understanding people's attitudes and beliefs about COVID-19 vaccines
Consent Form (UBCO students)
Who is conducting this study? Dr. Carolyn Szostak is the Principal Investigator. She is an Associate Professor of Psychology at the University of British Columbia (Okanagan Campus; UBCO). She can be reached by telephone at 250-807-8736. Her email address is: carolyn.szostak@ubc.ca.

The study team also includes three co-investigators: Dyuthi Dinesh is an Honours student in the Department of Psychology, is a Co-Investigator. This research is the basis for her Honours thesis. Keyara Brody is an undergraduate student who is majoring in Psychology. This research is the basis for a Directed Studies project. Finally, Gloria Hyun Cho is a graduate student in the Clinical Psychology program at UBCO.

This study is funded by money given to Dr. Carolyn Szostak from the UBC Okanagan Office of the Provost.

A bit about the study: Since March 2020, it seems that our lives have been turned upside-down by changes that have arisen because of the COVID-19 pandemic. At the present time, we continue to be dealing with a number of Public Health orders, including strong encouragement to get vaccinated. Opinions about the COVID-19 virus and associated vaccines are very polarized. That is, some people believe that we are in the midst of a pandemic while others don't. Similarly, some people believe that getting vaccinated is the "right" thing to do, while others are not sure if the vaccines are safe. Still others, believe that it's all a scam. We are interested in trying to understand these various opinions and beliefs.

Please be aware that if you take part in this study, you will be asked several questions about your beliefs and experiences related to the COVID-19 virus and vaccines. If you are not comfortable sharing your opinions and experiences, please do not participate.

Who can take part in this study? All UBC Okanagan undergraduate and graduate students are eligible to participate.

What is required of you? This study involves completing an online survey. The survey is hosted by UBC Survey Tool (Qualtrics). The survey will include socio-demographic questions as well as questions about your attitudes towards COVID-19, vaccinations, science, politics, and your social media use and preferences. The survey should take 30-45 minutes to complete. We ask that you try to complete it all at once. However, if you need to take short breaks, you can. While some studies allow you to save your survey and complete it later on, for this study, you must complete it within 2 hours of starting the survey. If you take a break,

please be sure that you do not close the window/tab or quit your browser.

If you choose to participate in this study, you will be asked some questions that are of a personal nature. For example, you will be asked questions about your COVID-19 fears and beliefs, and your stance and status on the COVID-19 vaccinations. It is important to know that there are no right or wrong answers to these questions. We are interested in learning what your personal beliefs and experiences are. Please try to be as open and honest as possible. While we ask that you try to answer all questions, if there are any that you don't want to answer, you are free to leave those questions blank. If you feel uncomfortable at all during the survey you may also stop participating at any time without explanation.

What are the risks of taking part in this study? The risks associated with this study are low. However, we acknowledge that the topic may be difficult for some individuals. If you do experience any uncomfortable feelings or start to feel upset, you don't have to answer those questions. You can also stop participating at any time. At the end of the survey, you will be provided with a list of available resources.

What are the benefits of taking part in this study? While we can't promise that you will gain anything from taking part in our study, you may find that you have a greater awareness and understanding of how you personally feel about the COVID-19 pandemic and the vaccines.

Will you be paid for taking part in this study? You will not be paid to participate in the study. However, if you want, your name will be entered to win one of two $100.00 amazon.ca gift cards (or receive an e-transfer for the same amount). Winners will be required to answer a skill-testing question. Alternatively, if you are eligible to receive Psychology SONA credits, you can choose instead to receive 1.0 SONA credits.

How will your privacy be protected? As indicated previously, the survey is hosted by the UBC Survey Tool (Qualtrics), a secure, Canadian survey system that meets all of the requirements of the BC Freedom of Information and Protection of Privacy Act. All data are stored and backed up in Canada. Only members of the study team will be able to access any of the files associated with this study.

Your participation will be confidential but not anonymous. We will not ask you to provide any identifying information on the survey itself. However, if you want to enter the draw or receive SONA credits, you will be automatically directed to a separate, independent survey site (also hosted by Qualtrics). Here, you will need to enter your name and preferred contact information (email address or telephone number). Thus, the researchers will know who participated but we will not be able to connect your name to your answers. Because of this, it is not possible to withdraw from the study once you have submitted your answers.

Once the survey is closed, Dr. Carolyn Szostak will download the files from Qualtrics and save them on her encrypted UBC laptop. The files will then be deleted from the Qualtrics site. Only Dr. Szostak will have access to the file with your name and contact information. This file will be destroyed once the SONA credits have been assigned, and the draw has been conducted and all of the prizes awarded.

The file of survey responses will be shared with the co-investigators using a folder on OneDrive that only members of the study team can access. Copies of the datafile will be stored temporarily on the students' password-protected computers while they are analyzing the data and working on their papers and any publications or presentations that arise from this study.

A summary of the findings will be available once the study is finished and the data have been analyzed. This report will not include individual responses. Instead, only group findings will be described. If you are interested in receiving a copy of this summary report, please email Carolyn Szostak (carolyn.szostak@ubc.ca). It will be sent to you as soon as it becomes available. As indicated previously, this study is the basis for Dyuthi Dinesh's Honours Thesis in Psychology. Her thesis is considered a public document and may be available on the Internet. We also hope to publish the results in scientific journals/magazines and present our findings at professional conferences.

The survey datafile will be stored securely in a designated password-protected section of the UBC computer network for at least five years after the results of the study have been published. After this time, it will be securely deleted.

Will the data be used for other purposes? No other uses are planned for the data from this study.

Who can you contact if you have questions about this study? If you have any questions or concerns about what we are asking of you, please contact Dr. Carolyn Szostak at 250-807-8736 or by email at Carolyn.Szostak@ubc.ca.

Who can you contact if you have complaints or concerns about this study?
If you have any concerns about your rights as a research participant and/or your experiences while participating in this study, you may contact the Research Participant Complaint Line in the UBC Office of Research Services at 1-877-822-8598 or the UBC Okanagan Research Services Office at 250-807-8832. You can also contact them by email: RSIL@ors.ubc.ca. Please reference the study number H21-00645 when calling so the Complaint Line staff can better assist you.

Would you like to participate in this study? Taking part in this study is entirely up to you. If you have any questions that you would like answered before you decide whether you are going to participate (or not), please contact Carolyn Szostak (carolyn.szostak@ubc.ca). You are encouraged to keep a copy of this consent form. Please click on the link below to download a copy.

You have the right to refuse to participate in this study. If you decide to take part, you may choose not to complete the survey at any time by quitting your browser.

If you would like to participate, please click on the arrow below to begin the survey. This will indicate that you have read and understood the above information and have consented to participate in this study. If you do not wish to participate, please exit this website.

Covid consent form ubco

Personal Information Questionnaire

A reminder ... while it is most helpful for the purpose of the research if you answer all of the questions, if there are any that you are not comfortable answering, you are free to leave them blank.

We are interested in knowing about your thoughts, beliefs, and experiences! As such, there are no "right" or "wrong" answers. Please answer the questions in as open and honest a manner as you can.

Age

How old are you (in years):

_____

Gender

Please Indicate your gender:

- ○ Female gender (1)
- ○ Male gender (2)
- ○ Non-binary gender (3)
- ○ Prefer not to answer (4)

Would you describe yourself as:

- ○ Cisgender (i.e., someone whose gender identity matches their assigned sex at birth) (1)
- ○ Transgender (i.e., someone whose gender identity does not match their assigned sex at birth) (2)
- ○ Prefer not to answer (3)

Ethnicity

Which of the following best describes your ethnic background? Please indicate all that apply.

- ☐ Indigenous (Inuit/First Nations/Métis) (1)
- ☐ White/European (2)
- ☐ Black/African/Caribbean (3)
- ☐ Southeast Asian (e.g., Chinese, Japanese, Korean, Vietnamese, Cambodian, Filipino, etc.) (4)
- ☐ Arab (Saudi Arabian, Palestinian, Iraqi, etc.) (5)
- ☐ South Asian (East Indian, Sri Lankan, etc.) (6)
- ☐ Latin American (Costa Rican, Guatemalan, Brazilian, Columbian, etc.) (7)
- ☐ West Asian (Iranian, Afghani, etc.) (8)
- ☐ Other (please specify): (9)

_____

Program of study

What is your program of study?

- ○ IK Barber Faculty of Arts & Social Sciences (1)
- ○ IK Barber Faculty of Science (2)
- ○ Faculty of Creative & Critical Studies (3)
- ○ Faculty of Health & Social Development - Health and Exercise Sciences (4)
- ○ Faculty of Health & Social Development - Nursing (5)
- ○ Faculty of Management (6)
- ○ School of Engineering (7)
- ○ Faculty of Education - Okanagan School of Education (8)
- ○ Faculty of Medicine - Southern Medical Program (9)
- ○ College of Graduate Studies -- Masters (10)
- ○ College of Graduate Studies -- Doctoral (11)

Student status

Are you a full-time or a part-time student?

- ○ Full-time (1)
- ○ Part-time (2)

Degree year

Considering your current degree program, what year are you in?

- 1st year (1)
- 2nd year (2)
- 3rd year (3)
- 4th year (4)
- 5th year or more (5)

Current location

Where are you currently living?

- Okanagan Central region (i.e., Kelowna, Lake Country, West Kelowna, Peachland, or surrounding community) (1)
- North Okanagan (e.g., Vernon, Armstrong, Enderby, Lumby) (2)
- South Okangan (e.g., Summerland, Penticton, etc.) (3)
- Elsewhere in British Columbia (4)
- Elsewhere in Canada (5)
- Outside of Canada (6)

_____

Work status

Do you work while attending school?

- No (1)
- Part-time (2)
- Full-time (3)

Political Ideology self-report

In politics, people sometimes talk about being liberal or conservative. Where would you place YOURSELF on a scale from 0 to 10, where 0 means very conservative and 10 means very liberal?

	Very conservative 0 1 2 3 4 5 6 7 8 9 10 Very liberal
()	

End of Block: PIQ

Start of Block: PIQ_COVID

COVID-19 infection

Have you ever contracted COVID-19?

- Yes (1)
- No (2)
- Prefer not to say (3)

COVID-19 vaccination status

Are you vaccinated against COVID-19?

- Yes: partially (1)
- Yes: fully (2)
- No (4)
- Prefer not to say (3)

Do you intend to get fully vaccinated against COVID-19?

- ○ Yes (1)
- ○ No (2)
- ○ Not sure (3)
- ○ Prefer not to say (4)

How long has it been since you received the first dose of the COVID-19 Vaccine?

- ☐ less than a week (1)
- ☐ less than a month (2)
- ☐ 1-2 months ago (3)
- ☐ 3-4 months ago (4)
- ☐ 4-8 months ago (5)
- ☐ Prefer not to say (6)

How long has it been since you received the second dose of the COVID-19 Vaccine?

- ○ less than a week (1)
- ○ less than a month (2)
- ○ 1-2 months ago (3)
- ○ 3-4 months ago (4)
- ○ 4-8 months ago (5)
- ○ Prefer not to say (6)

Reason for getting vaccinated

What was the primary reason that you got vaccinated against COVID-19?

- ○ To protect myself against COVID-19 (1)
- ○ To protect my community and people around me (2)
- ○ I want to be able to get a vaccine passport so that I can go to restaurants and bars/nightclubs and take part in other "non-essential services" (3)
- ○ I want to be able to travel (4)
- ○ It was necessary/required for my workplace (5)
- ○ Other (6) _____

Vaccine Beliefs measure

The following questions are about your thoughts regarding approved COVID-19 vaccines.

If my family or friends were thinking of getting a COVID-19 vaccination, I would:

- ○ Strongly encourage them (1)
- ○ Encourage them (2)
- ○ Not say anything to them about it (3)
- ○ Ask them to delay getting the vaccination (4)
- ○ Suggest that they do not get the vaccination (5)

Getting vaccinated against COVID-19 is:

- ○ Really important (1)
- ○ Important (2)
- ○ Neither important nor unimportant (3)
- ○ Unimportant (4)
- ○ Really unimportant (5)

If it was recommended to get a repeat vaccination for COVID-19 every year, I would:

- ○ Get it every year without fail (1)
- ○ Most likely get it every year (2)
- ○ Maybe get it every year (3)
- ○ Be unlikely to get it every year (4)
- ○ Definitely not get it every year (5)

Getting vaccinated against COVID-19 is:

- Very safe (1)
- Safe (2)
- It is not clear if it is safe or unsafe (3)
- Unsafe (4)
- Very unsafe (5)

By getting vaccinated against COVID-19, I am:

- Taking control of the situation (1)
- Gaining some control over the situation (2)
- Unsure whether I gain or lose control of the situation (3)
- Giving up some control of the situation (4)
- Giving up all control of the situation (5)

End of Block: PIQ_COVID

Start of Block: Media (COVID) (ICM)

Information Consumption Measure

ICM 1

Currently, how often do you check the news regarding COVID-19?

- ○ Never (1)
- ○ Rarely (2)
- ○ Sometimes (3)
- ○ Quite often (4)
- ○ Constantly (5)

ICM 2

How often do you use the following to get information about COVID-19?

	Never (1)	Sometimes (2)	About half the time (3)	Most of the time (4)	All the time (5)
Conversations with friends/family/colleagues (1)	○	○	○	○	○
Official Government websites (2)	○	○	○	○	○
Official international health authority websites (e.g., WHO) (3)	○	○	○	○	○
Scientific articles (4)	○	○	○	○	○
Word of mouth (5)	○	○	○	○	○
News (TV, radio or internet) (6)	○	○	○	○	○
Social media (7)	○	○	○	○	○
Other websites: (8)	○	○	○	○	○

ICM 3

How often do you check that the source of information about COVID-19 is legitimate/trusted?

- Never (1)
- Sometimes (2)
- About half the time (3)
- Most of the time (4)
- All the time (5)

ICM 4

(1) *Trust in Scientists as a source of COVID information

Rate how much you trust:

	Strongly distrust (1)	Somewhat distrust (2)	Neutral (3)	Somewhat trust (4)	Strongly trust (5)
scientists as a source of information about COVID-19* (1)					
the media as a source of information about COVID-19 (2)					
friends as a source of information about COVID-19 (3)					

End of Block: Media (COVID) (ICM)

Start of Block: Science Literacy (NSB)

National Science Board Scientific Knowledge measure

Please indicate if you believe the following statements are either True or False

	True (1)	False (2)

The Sun goes around the Earth. (1)	○	○
The center of the Earth is very hot. (2)	○	○
The oxygen we breathe comes from plants. (3)	○	○
Radioactive milk can be made safe by boiling it. (4)	○	○
Electrons are smaller than atoms. (5)	○	○
The continents on which we live have been moving for millions of years and will continue to move in the future. (6)	○	○
It is the mother's genes that decide whether the baby is a boy or a girl. (7)	○	○
The earliest humans lived at the same time as the dinosaurs. (8)	○	○
Antibiotics kill viruses as well as bacteria (9)	○	○
Lasers work by focusing sound waves. (10)	○	○
All radioactivity is man-made. (11)	○	○
Human beings, as we know them today, developed from earlier species of animals. (12)	○	○
It takes 1 month for the Earth to go around the Sun. (13)	○	○
The Universe began with a huge explosion (14)	○	○

End of Block: Science Literacy (NSB)

Start of Block: Stress Scale

In the following statements, we refer to COVID-19 as "the virus". Please read each statement and indicate how frequently each problem has been for you during the past seven days.

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Almost always (5)

I had trouble sleeping because I worried about the virus (1)	○	○	○	○	○
I had bad dreams about the virus (2)	○	○	○	○	○
I thought about the virus when I didn't mean to (3)	○	○	○	○	○
Disturbing mental images about the virus popped into my mind against my will (4)	○	○	○	○	○
I had trouble concentrating because I kept thinking about the virus (5)	○	○	○	○	○
Reminders of the virus caused me to have physical reactions, such as sweating or a pounding heart (6)	○	○	○	○	○

The following are kinds of worries that you might have experienced over the past seven days. Again, for these statements, we refer to COVID-19 as "the virus".

	Not at all (1)	Slightly (2)	Moderately (3)	Very (4)	Extremely (5)
I am worried about catching the virus (1)	○	○	○	○	○
I am worried that basic hygiene (e.g., handwashing) is not enough to keep me safe from the virus (2)	○	○	○	○	○
I am worried that our healthcare system is unable to keep me safe from the virus (3)	○	○	○	○	○
I am worried that I can't keep my family safe from the virus (4)	○	○	○	○	○
I am worried that our healthcare system won't be able to protect my loved ones (5)	○	○	○	○	○
I am worried that social distancing is not enough to keep me safe from the virus (6)	○	○	○	○	○

End of Block: Stress Scale

Start of Block: Social Media Integration

Social Media Use Integration Scale

Please indicate how much you agree or disagree with the following statements

	Strongly Disagree 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	Strongly agree 7 (7)
I feel disconnected from friends when I have not logged into social media (1)	○	○	○	○	○	○	○
I would like it if everyone used social media to communicate (2)	○	○	○	○	○	○	○
I would be disappointed if I could not use social media at all (3)	○	○	○	○	○	○	○
I get upset when I can't log on to social media (4)	○	○	○	○	○	○	○
I prefer to communicate with others mainly through social media (5)	○	○	○	○	○	○	○
Social media plays an important role in my social relationships (6)	○	○	○	○	○	○	○
I enjoy checking my social media account (7)	○	○	○	○	○	○	○
I don't like to use social media (8)	○	○	○	○	○	○	○
Using social media is part of my everyday routine (9)	○	○	○	○	○	○	○
I respond to content that others share using social media (10)	○	○	○	○	○	○	○

End of Block: Social Media Integration

Start of Block: Protective Beh (Kleitman)

Rate the extent to which each item describes your behaviour in the past week

	Does not apply at all 0 10 20 30 40 50 60 70 80 90 100 Applies very much
I stayed at home ()	

	Does not apply at all 0 10 20 30 40 50 60 70 80 90 100 Applies very much
I did not attend social gatherings ()	

Page Break

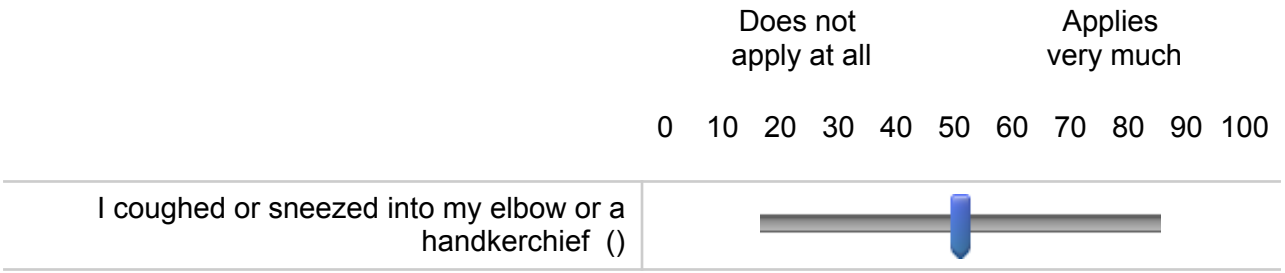
In the past week:

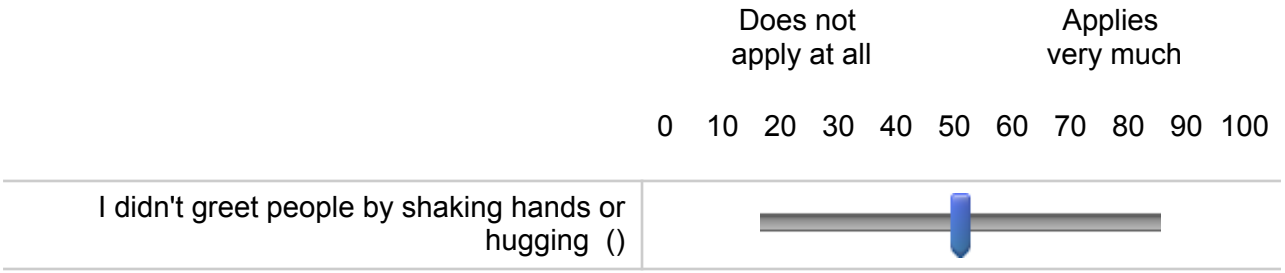
	Does not apply at all 0 10 20 30 40 50 60 70 80 90 100 Applies very much
I kept a distance of at least two meters from other people ()	

	Does not apply at all 0 10 20 30 40 50 60 70 80 90 100 Applies very much
I washed my hands frequently ()	

Page Break

In the past week:





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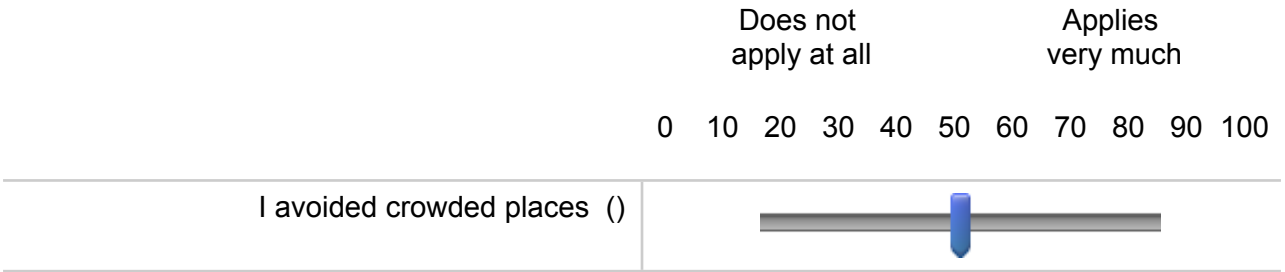
In the past week:



I didn't get together with friends in person ()	

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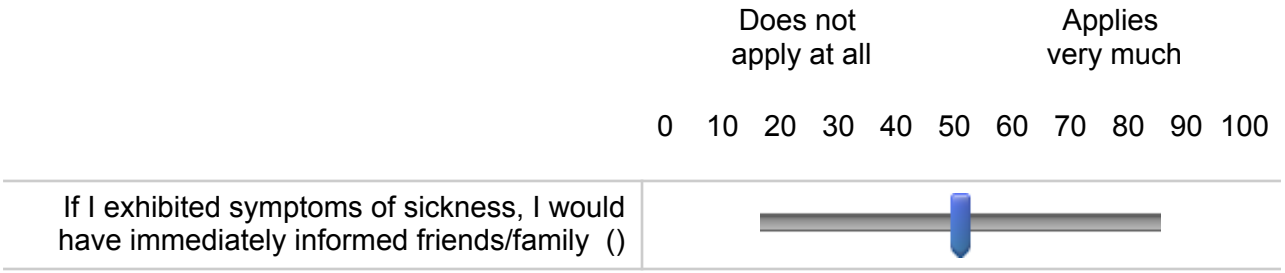
In the past week:



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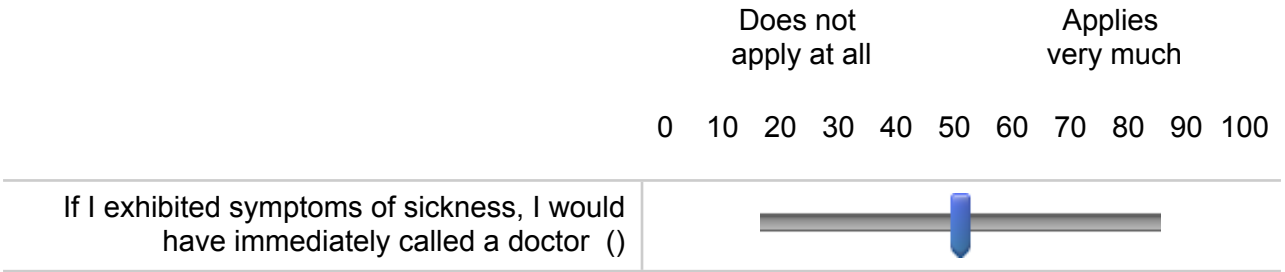
In the past week:



	0 10 20 30 40 50 60 70 80 90 100
If I exhibited symptoms of sickness, I would have immediately self-isolated ()	

End of Block: Protective Beh (Kleitman)

Start of Block: COVID Beliefs (Kleitman)

Rate the extent to which you agree or disagree with the following statements

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
People should cancel their participation at social gatherings right now (1)	○	○	○	○	○
There should be a general curfew (with the exception of grocery shopping, medical treatments, and work for essential occupations) right now (2)	○	○	○	○	○
Risky behaviours, which might enable the spread of COVID-19, should be financially punished (3)	○	○	○	○	○
Social distancing is effective in slowing the spread of COVID-19 (4)	○	○	○	○	○
Social distancing will likely destroy our economy (5)	○	○	○	○	○

Social distancing for children is unnecessary and adds burden on parents (6)	○	○	○	○	○
If we don't practice social distancing, the curve will get steeper and the number of COVID-19 cases and deaths will increase (7)	○	○	○	○	○
A flatter curve means less burden on the healthcare system (8)	○	○	○	○	○
Governments should test, track and trace every potential case of COVID-19 (9)	○	○	○	○	○
We should rely on people getting COVID-19 in order to build up (herd) immunity (10)	○	○	○	○	○

End of Block: COVID Beliefs (Kleitman)

Start of Block: Media Use (Pew)

PEW Resource Centre Media Use measure

PEW 1

Think about all the different media sources that you use to find out about current events. Please indicate for each of the following sources, how often you get news from each of them.

	Often (1)	Sometimes (2)	Rarely (3)	Never (4)
News websites or apps (1)	○	○	○	○
Social media (such as Facebook, Twitter, Instagram, Youtube, Reddit, etc.) (2)	○	○	○	○
Search through Google or other search engines (3)	○	○	○	○
Podcasts (4)	○	○	○	○
Newspapers (hard/paper copy) (5)	○	○	○	○
TV (6)	○	○	○	○
Weekly/monthly magazines (7)	○	○	○	○

Social media total

Do you REGULARLY get news or news headlines on any of the following social media sites or apps? By "news" we mean information about events and issues that involve more than just your friends or family.

	Yes (1)	No (2)
Twitter (1)	○	○
Instagram (2)	○	○
Facebook (3)	○	○
Snapchat (4)	○	○

YouTube (5)	○	○
LinkedIn (6)	○	○
Reddit (7)	○	○
Tumblr (8)	○	○
WhatsApp (9)	○	○
TikTok (10)	○	○
Twitch (11)	○	○

Page Break

Perceived Social media news Accuracy

Which of the following best describes how you approach news stories from social media sites, even if neither is exactly right?

I expect the news I see on social media will:

- ○ Largely be accurate (1)
- ○ Be somewhat accurate (2)
- ○ Be somewhat inaccurate (3)
- ○ Largely be inaccurate (4)

Perceived Social media news Helpfulness

Overall, would you say news on social media has

- ○ Helped you to better understand current events (1)
- ○ Made you more confused about current events (2)
- ○ Not made much of a difference (3)

End of Block: Media Use (Pew)

Start of Block: OCEANS L

Coronavirus Conspiracy Beliefs measure

COVID-19 conspiracy: Broad

For each statement, please indicate how much you disagree or agree:

	Do not agree (1)	Agree a little (2)	Agree moderately (3)	Agree a lot (4)	Agree completely (5)
COVID-19 virus is a hoax. (1)	○	○	○	○	○
COVID-19 virus is man-made. (2)	○	○	○	○	○
The spread of the COVID-19 virus is a deliberate	○	○	○	○	○

attempt to reduce the size of the global population. (3)					
The spread of the COVID-19 virus is a deliberate attempt by governments to gain political control. (4)	○	○	○	○	○
The spread of the COVID-19 virus is a deliberate attempt by a group of powerful people to make money. (5)	○	○	○	○	○
The spread of the COVID-19 virus is a deliberate attempt by one nation to destabilize another. (6)	○	○	○	○	○
The spread of the COVID-19 virus is a deliberate attempt by global companies to take control. (7)	○	○	○	○	○

Page Break

COVID-19 conspiracy: Specific

For each statement, please indicate how much you disagree or agree:

	Do not agree (1)	Agree a little (2)	Agree moderately (3)	Agree a lot (4)	Agree completely (5)
COVID-19 is a bioweapon developed by China to destroy the West. (1)	○	○	○	○	○
COVID-19 is a biological weapon manufactured by the United States. (2)	○	○	○	○	○
The United Nations (UN) and World Health Organisation (WHO) have manufactured the COVID-19 virus to take global control. (3)	○	○	○	○	○
Jews have created the COVID-19 virus to collapse the economy for financial gain. (4)	○	○	○	○	○
The elite have created the COVID-19 virus in order to establish a one-world government. (5)	○	○	○	○	○
Bill Gates has created the COVID-19 virus in order to reduce the world	○	○	○	○	○

population. (6) Big Pharma created COVID-19 to profit from the vaccines. (7)	○	○	○	○	○
COVID-19 is being used by the government to implement a police state. (8)	○	○	○	○	○
COVID-19 is caused by 5G and is a form of radiation poisoning transmitted through radio waves. (9)	○	○	○	○	○
The COVID-19 virus is a smokescreen for a global conspiracy that swapped the real world with a simulation (10)	○	○	○	○	○

Page Break

	Do not agree (1)	Agree a little (2)	Agree moderately (3)	Agree a lot (4)	Agree completely (5)
COVID-19 was created to force everyone to get vaccinated. (1)	○	○	○	○	○
The COVID-19 vaccine will be used to carry out mass sterilization. (2)	○	○	○	○	○
The World Health Organization (WHO) already has a vaccine and are withholding it. (3)	○	○	○	○	○
Antibody testing is a plot to harvest our DNA. (4)	○	○	○	○	○

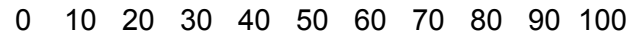
End of Block: OCEANS L

Start of Block: OCEANS M

Conspiracy mentality measure

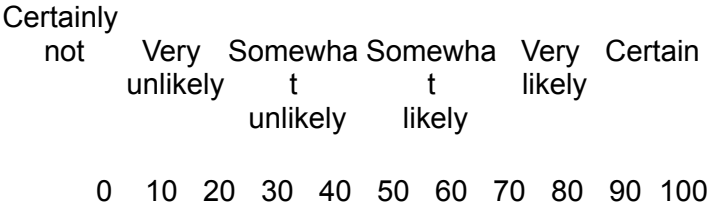
Please rate each of the following statements according to the scale below. Slide the marker to the point that matches your belief.

	Certainly not	Very unlikely	Somewhat unlikely	Somewhat likely	Very likely	Certain

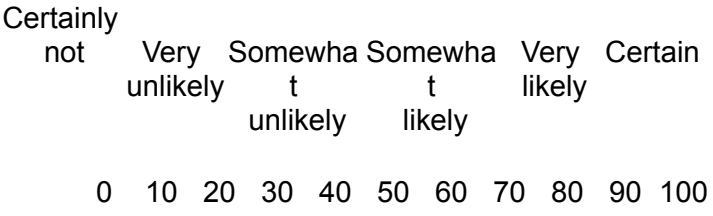


I think that many very important things happen in the world, which the public is never informed about. ()	

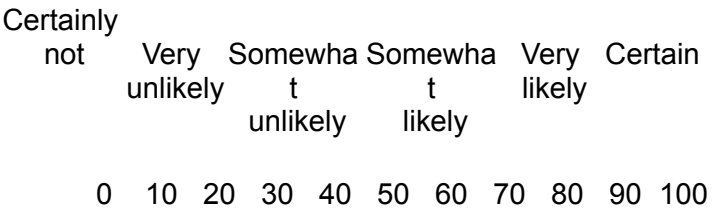
Please rate each of the following statements according to the scale below. Slide the marker to the point that matches your belief.



I think that politicians usually do not tell us the true motives for their decisions. ()	



I think that government agencies closely monitor all citizens. ()	



I think that events which superficially seem to lack a connection are often the result of secret activities. ()	

Certainly not | Very unlikely | Somewhat unlikely | Somewhat likely | Very likely | Certain

0 10 20 30 40 50 60 70 80 90 100

I think that there are secret organizations that greatly influence political decisions. ()	

End of Block: OCEANS M

Start of Block: OCEANS G

The following statements are about medical doctors. Please indicate how much you disagree or agree:

	Disagree completely (1)	Disagree (2)	Agree (3)	Agree completely (4)
I trust doctors (1)	○	○	○	○
They do not really care about me (2)	○	○	○	○
They have my best interests at heart (3)	○	○	○	○
They look down on me (4)	○	○	○	○
They have little respect for me (5)	○	○	○	○
They want to do their best (6)	○	○	○	○
They have no idea what my life is like (7)	○	○	○	○

They often make mistakes (8)	○	○	○	○
They are in it for the money (9)	○	○	○	○
They would give me a vaccine even if it was bad for me (10)	○	○	○	○
I do not trust doctors (11)	○	○	○	○

Page Break

The following statements are about COVID-19 vaccine developers. Please indicate how much you disagree or agree.

	Disagree completely (1)	Disagree (2)	Agree (3)	Agree completely (4)
They put safety first (1)	○	○	○	○
I do not trust the vaccine developers (2)	○	○	○	○
They just want to make money (3)	○	○	○	○
They do not care about helping people (4)	○	○	○	○
They do not properly check that the vaccine is safe (5)	○	○	○	○

End of Block: OCEANS G

Start of Block: Politics: SESC

Social and Economic Conservatism Scale (SECS)

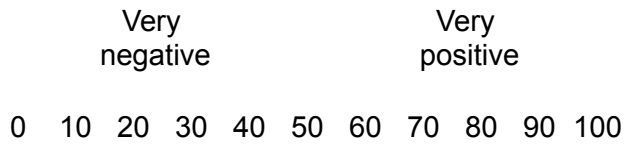
Please indicate the extent to which you feel positive (in favour of) or negative (against) towards each issue. Scores of 0 indicate greater negativity, and scores of 100 indicate greater positivity. Scores of 50 indicate that you feel neutral about the issue.

	Very negative 0 10 20 30 40 50 60 70 80 90 100 Very positive
Abortion ()	
Limited government ()	

	Very negative 0 10 20 30 40 50 60 70 80 90 100 Very positive

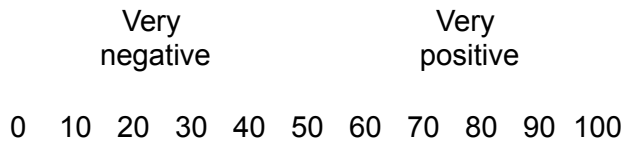
Military and national security ()	
Religion ()	

Page Break

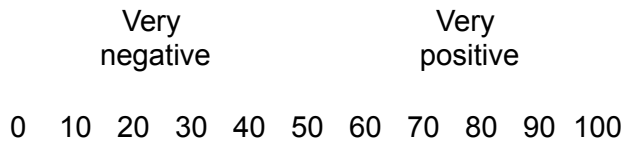


Welfare benefits ()	
Gun ownership ()	

Page Break



Traditional marriage ()	
Traditional values ()	



Fiscal responsibility ()	

Business ()	

Page Break

	Very negative 0 10 20 30 40 50 60 70 80 90 100 Very positive
The family unit ()	
Patriotism ()	

End of Block: Politics: SESC

Start of Block: OCEANS D

This is about vaccines in general. It is not specifically about the COVID-19 vaccine. For each statement, please indicate if you think it is correct, incorrect, or you don't know.

	Correct (1)	Incorrect (2)	Do not know (3)
Vaccines are unnecessary, as diseases can be treated (e.g. with antibiotics). (1)	○	○	○
Without broadly applied vaccine programmes, smallpox would still exist. (2)	○	○	○
The efficacy of vaccines has been proven. (3)	○	○	○
Children would be more resistant if they were not always vaccinated against all diseases. (4)	○	○	○
Diseases like autism, multiple sclerosis, and diabetes might	○	○	○

be triggered through vaccination. (5)	○	○	○
The immune system of children is not overloaded through many vaccinations. (6)	○	○	○
Many vaccinations are administered too early, so that the body's own immune system has no possibility to develop. (7)	○	○	○
The doses of the vaccines are not dangerous for humans. (8)	○	○	○
Vaccinations increase the occurrence of allergies. (9)	○	○	○

End of Block: OCEANS D

Start of Block: OCEANS N (Vac gen)

These questions relate to vaccines in general. They are not specific to COVID-19. For each statement, please indicate how much you disagree or agree:

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neutral (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
Vaccine safety data is often fabricated (made up). (1)	○	○	○	○	○	○	○
Immunizing children is harmful and this fact is covered up. (2)	○	○	○	○	○	○	○
Pharmaceutical companies cover up the dangers of vaccines. (3)	○	○	○	○	○	○	○
People are deceived about the effectiveness of vaccines. (4)	○	○	○	○	○	○	○

Vaccine effectiveness data is often fabricated (made up). (5)	○	○	○	○	○	○	○
People are deceived about vaccine safety. (6)	○	○	○	○	○	○	○
The government is trying to cover up the link between vaccines and autism. (7)	○	○	○	○	○	○	○

End of Block: OCEANS N (Vac gen)

Start of Block: Belief in Science

Belief in Science Scale (BISS)

Please indicate the extent to which you agree with the following statements

	Strongly disagree 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	Strongly agree 6 (6)
Science provides us with a better understanding of the universe than does religion. (1)	○	○	○	○	○	○
“In a demon-haunted world, science is a candle in the dark.” (Carl Sagan) (2)	○	○	○	○	○	○
We can only rationally believe in what is scientifically provable. (3)	○	○	○	○	○	○
Science tells us everything there is to know about	○	○	○	○	○	○

what reality consists of. (4)						
All the tasks human beings face are solvable by science. (5)	○	○	○	○	○	○
The scientific method is the only reliable path to knowledge. (6)	○	○	○	○	○	○
The only real kind of knowledge we can have is scientific knowledge. (7)	○	○	○	○	○	○
Science is the most valuable part of human culture. (8)	○	○	○	○	○	○
Science is the most efficient means of attaining truth. (9)	○	○	○	○	○	○
Scientists and science should be given more respect in modern society. (10)	○	○	○	○	○	○

End of Block: Belief in Science

Start of Block: Debrief

Debriefing Form

Thank you participating in our study, *Differing opinions: COVID-19*! We greatly appreciate your time and effort. And, we hope that you found the experience to be interesting.

As indicated in the consent form, we are interested in understanding people's attitudes and beliefs about COVID-19. To this end, the survey included questions about a lot of different topics. You were asked a number of questions about COVID-19 and associated vaccines. We also explored your more general beliefs about health, medicine, and vaccines. Finally, you were asked questions about your political beliefs, understanding of science, and social media use and preferences. In analyzing the data, we will be determining how people's beliefs and experiences in these different domains fit together, or are inter-correlated with each other. We hope that this information will help us (and others) to better understand the differing opinions that exist about COVID-19 and COVID-19 vaccines. Moreover, the results may help to develop better ways of presenting accurate information about these issues in a more accessible way.

In case you find yourself talking with someone (perhaps, a friend or family member) about this research, we would appreciate it if you would encourage them to take part in the study. However, we ask that you not tell them too much about the specific kinds of questions as this could influence how they answer some of the questions.

We would also like to take this opportunity to highlight some resources that are available. It is hoped that these sources will help you answer questions that you might have about COVID-19 and the available vaccines, and how to evaluate the trustworthiness of media reports. Finally, we have included some resources that are available to help people better manage the anxiety and distress that many are experiencing because of the COVID-19 pandemic.

Information about COVID-19 in BC:

http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data
This site provides up-to-date and detailed information about COVID-19 data in BC. Through this site, you can also access the BC COVID-19 Dashboard, which is updated Monday-Friday at 4 pm.

http://www.bccdc.ca/health-info/diseases-conditions/covid-19/prevention-risks
This site includes information about COVID-19 risk factors (that is, what increases the likelihood that someone will get COVID-19) and what can be done to help prevent getting sick with the COVID-19 virus.

http://www.bccdc.ca/health-info/diseases-conditions/covid-19/covid-19-vaccine/vaccine-safety#aefi
If you are interested in learning more about the COVID-19 vaccination and its safety, we recommend that you go to the British Columbia's Centre for Disease Control's Vaccine safety page listed above.

To understand more about fake news and COVID-19 misinformation, we recommend reading the following articles:
https://www.snopes.com/news/2021/03/11/one-year-covid-infodemic/
https://www.webwise.ie/teachers/what-is-fake-news/
If you are not sure how to detect fake news and would like to become more skilled at evaluating the trustworthiness of information that you read or hear about, you may find the following site helpful:
https://www.factcheck.org/2016/11/how-to-spot-fake-news/
Finally, the pandemic has been and continues to be a very challenging and difficult time for many people. Levels of distress, depression, and anxiety have increased and are being experienced by more and more people. If you would like to talk with someone about your concerns and how you are coping with the pandemic, we have included three different sources.

First, we would like to tell you about the **UBCO Walk-in Wellness Clinic**. The Clinic is open Tuesdays and Thursdays. You can call, email, or go in-person. For more information, go to: https://psych.ok.ubc.ca/psychology-clinic/walk-in-wellness/ Alternatively, phone: 250-807-8241 or email: ipc.ok@ubc.ca

UBCO Psychology Department also runs the **Psychology Clinic**, which offers low-cost, evidence-based psychological care to the public, as well as students, staff, and faculty of UBCO. Fees and eligibility of services are determined by a variety of factors and will be discussed individually. Referrals are not required. The Clinic is open Monday-Friday 9:00 am – 5:00 pm, and some evenings. For more information, call 250-807-8241 or email: ipc.ok@ubc.ca You can also visit their website: https://psych.ok.ubc.ca/psychology-clinic/

Finally, mental health services for specific groups of people or type of difficulty are available. Some of these services are also available online or by telephone. To find the resource that is best for you, visit:

http://www.bccdc.ca/health-info/diseases-conditions/covid-19/about-covid-19/mental-well-being-during-covid-19

If you have any questions about our research or the above-listed resources, please contact: Dr. Carolyn Szostak (Department of Psychology, UBCO). You can reach her by telephone: 250-807-8736 (please leave a message) or by email: carolyn.szostak@ubc.ca.

Thank you again for your participation. It is greatly appreciated.

Covid debriefing form

End of Block: Debrief