

# Perceived Stress, Belief in Conspiracy Theories, and Anti-Vaccination Attitudes in a Canadian Sample

Soroush Sharafzadeh<sup>1</sup>, Doug Alards-Tomalin<sup>1</sup>

<sup>1</sup> Capilano University

## ABSTRACT

**Background:** The use of COVID-19 vaccinations to prevent serious illness and infection from the SARS-CoV-2 virus has been accepted by approximately two-thirds of the Canadian population, at the time that this article was completed. Although COVID-19 mRNA vaccines are widely accessible in North America, there remains a substantial portion of Canadians who demonstrate vaccine hesitancy. The objective of this study is to examine whether there exists a predictive relationship between one's perceived stress-levels, general support for conspiracy theories, and anti-vaccination attitudes.

**Methods:** Fifty-one participants from the Vancouver, British Columbia region were recruited through social media. Participants completed a survey, which asked about perceived stress, vaccine hesitancy, and belief in conspiracy theories. Regression models were developed to measure the association between perceived stress and vaccine hesitancy. Simple mediation analysis was conducted to determine if belief in conspiracy theories mediated the relationship between perceived stress and vaccine hesitancy.

**Results:** Higher levels of conspiratorial thinking were associated with increased vaccine hesitancy ( $\beta = -0.465, p < .001, 95\% \text{ CI } [-0.81, -0.21]$ ). Belief in conspiracies was not found to mediate the relationship between perceived stress-levels and vaccination attitudes.

**Discussion:** The results support a positive correlation between anti-vaccination attitude and the tendency to adopt general conspiracy beliefs. However, no association between vaccination attitudes and perceived stress was found, nor did conspiracy belief mediate the relationship between perceived stress and vaccination attitude. The role scientific uncertainty plays in civilian trust and conspiratorial thinking was explored. Some limitations include the use of a small sample size.

## INTRODUCTION

The development and usage of COVID-19 vaccines as a preventative health measure has, overall, been positively received, with two-thirds of Canadians (66.6%) fully vaccinated as of August 2021 (Pettersson et al., 2021). However, a substantial proportion of the population of industrialized countries have avoided vaccination; for example, in a study by Cerda and Garcia (2021) examining at the vaccine attitudes of Chileans, the number one reason cited for avoiding the COVID-19 vaccine, making up 40% of respondents, included concerns about the vaccine's overall safety and side effects. The World Health Organization recognizes vaccine hesitancy as one of the top ten threats to public safety (WHO, 2019), underscoring the importance of identifying factors associated with vaccine uptake.

Many unvaccinated individuals have expressed concerns regarding vaccine safety (Bogart et al., 2021), with some arising from conspiracy theories about the origin of COVID-19 (Hartman et al., 2021) and government conspiracy theories regarding the purpose of the vaccine – e.g., microchip tracking, population control etc. (Ullah et al., 2020). Furthermore, conspiracy theory formation may be utilized as a maladaptive coping strategy (Marchlewska et al., 2021), and has been connected to a variety of psychological factors including increases in perceived stress (Swami et al., 2016); anxiety (Green & Douglas, 2018; Grezesiak-Feldman, 2013); lack of agency/control (Kofta et al., 2020; Whitson & Galinsky, 2008); and increased reasoning biases (Kuhn et al., 2021).

In the current study, we wished to examine how general conspiratorial thinking and perceived stress may impact current vaccination attitudes related to COVID-19, which could inform decision-making regarding how to improve vaccine use as a preventative measure. To the best of our knowledge, no studies to date have examined the relationship between general stress, conspiracy beliefs, and COVID-19 vaccine hesitancy in a Canadian sample (van Mulukom et al., 2020); but have been examined in other parts of the world, including

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Correspondence  
Address correspondence to Soroush Sharafzadeh at  
soroushsharafzadeh@my.capilano.ca

the UK. The results of these studies have been mixed. For instance, some studies (Freeman et al., 2020a; Freeman et al., 2020b) have found COVID-19 conspiracy belief adoption to be strongly associated with variables linked to stress, including paranoia (Kuhn et al., 2021), and distrust stemming from perceived threats to "...societal change, uncertainty, powerlessness, lack of socio-political control, perception of lower social-status, less analytical thinking, and lower levels of education and income" (Freeman et al., p. 2, 2020a). Freeman et al. (2020a) further found that higher levels of COVID-19 conspiracy thinking were associated with reduced support for government health guidelines, and less willingness to take antibody tests, or to be vaccinated. Additionally, higher endorsements for conspiracy beliefs were found in this study compared to an earlier pre-COVID-19 study conducted by Freeman and Bentall (2017), suggesting that as stress-levels related to the pandemic have increased (Dozois & Mental Health Research Canada, 2021), so has the popularity of conspiracy beliefs.

Alternatively, Georgiou et al. (2020) failed to find a relationship between reported COVID-19 conspiracy beliefs and perceived stress. The authors concluded that COVID-19 conspiracy beliefs were strongly correlated to other types of conspiracy-based thinking (general conspiracy theories), but current perceived stress levels were unrelated to whether conspiracy theories were supported. The objective of the current study is to further examine whether a predictive relationship exists between perceived stress and conspiracy theory formation in a Canadian – in this case, British Columbian – sample. We hypothesized that belief in Generic Conspiracy Beliefs (GCB) would be associated with greater COVID-19 vaccine hesitancy. Additionally, a simple mediation model was used to test whether conspiratorial beliefs would mediate the relationship between perceived stress and vaccine hesitancy, e.g., an increase in perceived stress would result in greater support for conspiracy-theories leading to increased vaccine hesitancy.

## METHODS

### Participants

In total, 62 participants completed the survey in early August 2021 using the described recruitment methods. Of the 62 participants, 51 (82%) completed the survey. A recruitment message was posted on the primary investigator's Facebook account, and recruitment emails and scripts were sent to students attending classes at Capilano University over the 2021 summer semester. All participants resided in the Vancouver, British Columbia region at the time of data collection. No questions about demographic characteristics were collected to guarantee participant anonymity and help reduce social desirability response sets. This study was approved by the Capilano University Research and Ethics Board (REB).

### Measures

When designing the survey, several pre-existing, testing instruments were adopted and will be further discussed below (included in the appendix). The survey questions were divided into three sections: *vaccination attitude*, *perceived stress*, and the *generalist conspiracy scale*.

1. The vaccination attitude questions were formed with assistance from a previous scale (Akel et al., 2021) which was modified to reflect attitudes specific to COVID-19 vaccines (Cronbach's  $\alpha = 0.90$ ).

- The perceived stress questions were adopted from the Perceived Stress Scale (Cohen et al., 1994) (Cronbach's  $\alpha = 0.81$ ).
- The generalist conspiracy scale questions were obtained from <http://openpsychometrics.org> (Brotherton et al., 2013) and measure general conspiracy theory beliefs which are unrelated to COVID-19 (Cronbach's  $\alpha = 0.95$ ).

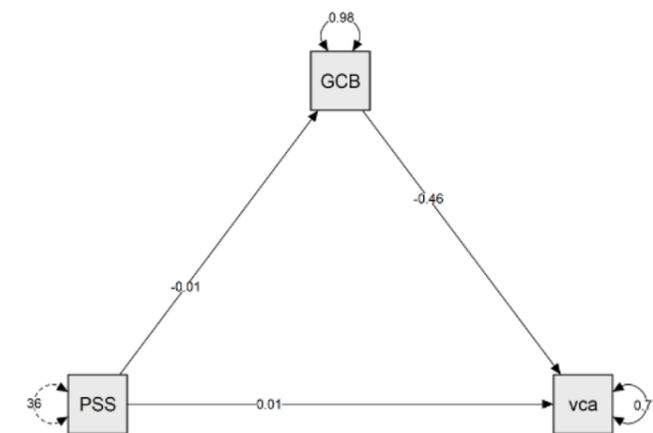
## Data analysis

Simple mediation analysis was completed in JASP (0.16.1) (JASP Team, 2022). Mediation analysis is used to explain whether the effect of a predictor variable (X) on a criterion variable (Y) can be accounted for by a mediating variable (M). In the current study, the direct and indirect regression coefficients between variables were calculated using standardized estimates, with 95% Confidence Intervals determined using a bootstrapping procedure of 1000 replications. The hypothesis that General Conspiratorial Beliefs (GCB) mediate a predictive relationship between Perceived Stress (PSS) and vaccination attitude (vca) was tested in this model.

## RESULTS

The direct and indirect effects were tested – via mediation analysis – of PSS and GCB on the dependent variable (vca), the means and standard errors of which are presented in Table 1. We evaluated the model (see Figure 1) which predicts that the relationship between Perceived Stress and Vaccination Attitude is mediated by the tendency to adopt conspiracy-based beliefs, testing the hypothesis that as stress levels increase, so will conspiracy theory-based thinking, resulting in higher vaccination hesitancy (Georgiou et al., 2020).

As shown in Figure 1, the model predicting an indirect (mediating) effect of GCB on the relationship between perceived stress and vca was not statistically significant ( $p = 0.69$ ). Similarly, the regression coefficients indicated no predictive relationship ( $b = -0.01$ ) of perceived stress levels on either GCB ( $p = 0.86$ ) or vca ( $p = 0.59$ ). There was, however, a significant direct effect of GCB on vca ( $p < .001$ ), indicating a negative relationship between the two variables ( $b = -0.46$ , 95% CI [-0.81, -0.21]).



**Figure 1** Mediation of the relationship of Perceived Stress (PSS) and Vaccination Attitude (vca) via General Conspiracy Belief (GCB)

Vaccination Attitude	Perceived Stress Scale	General Conspiracy Beliefs
3.845 (0.12)	18.118 (0.85)	2.739 (0.15)

**Table 1** Table depicting the average (mean) scores on Vaccination Attitude, Perceived Stress, and General Conspiracy Beliefs. Standard deviations are provided in brackets.

Note: Vaccination Attitude and General Conspiracy Belief were scored out of 5, while the highest score obtainable on Perceived Stress was 40 (with higher scores indicating greater stress). Higher scores on Vaccination Attitude indicate a more favourable reaction to vaccines, while higher scores on General Conspiracy Beliefs indicate greater adoption of conspiracy-based reasoning in day-to-day life.

## DISCUSSION

To summarize, the results do not support the existence of a mediated (indirect effect) relationship between perceived stress and vaccine hesitancy through conspiratorial belief (see also Georgiou et al., 2020). However, we found evidence that increased hesitancy toward COVID-19 vaccines is associated with conspiratorial beliefs, consistent with those demonstrated previously in UK samples (Georgiou et al., 2020 and Kuhn et al., 2021).

Additionally, we found that perceived stress indicated higher average stress rates now than when it was originally normed 20 years ago across multiple demographics. The highest score for a demographic recorded in 1994 was 14.7 out of 40 (Cohen et al., 1994), whereas in our sample we found a perceived stress mean of 18.1. We conclude that while stress-levels are clearly high across both people with pro and anti-vaccine sentiments, this stress is not specifically a factor in whether they adopt conspiracy-based beliefs about COVID-19.

The current study has a number of important limitations to consider. Firstly, our sample should rightfully be considered a non-probability, convenience sample, which is limited in both size and scope. Furthermore, given the nature of the topic, we thought it was important to protect the privacy of our participants and opted not to collect demographic details – but can confirm that the survey was only submitted to current residents of the Vancouver area. Additionally, we cannot confirm which vaccines were available to our participants, as some level of hesitancy may also be determined in part by the perceived health risk(s) attached to certain types of COVID-19 vaccines (mRNA, viral vector, etc.). In summary, we found that conspiracy-based thinking in general is a related factor to hesitancy of COVID-19 vaccines, which may prevent vaccine uptake. At the time of writing (August 2021), the vaccination rates for COVID-19 in British Columbia are 67% fully vaccinated and 75 % partially vaccinated (Little, 2020), with policymakers looking to increase vaccination rates. While mental health concerns, including anxiety and depression, have been exacerbated in Canada by the pandemic (Dozois & Mental Health Research Canada, 2021), the current results suggest that campaigns aimed at addressing/reducing the anxiety or stress of conspiracy-belief-prone individuals may not be particularly effective at increasing vaccination rates in this sub-population and that the use of mandates may only further distrust, as it can be easily incorporated into a conspiracy-based narrative.

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## APPENDIX

All questions will have a Likert scale to analyze the degree to which the participant agrees or disagrees to a statement, or how often the question applies to them (Part 2). The survey is split up into 3 parts.

For Parts 1 and 3: 1 = Strongly Disagree, 2 = Somewhat Disagree, 3 = Neutral, 4 = Somewhat Agree, 5 = Strongly Agree. For Part 2: 0 = never, 1 = Almost Never, 2 = Sometimes, 3 = Fairly Often, 4 = Very Often.

### Part 1: Vaccine Attitudes

1. The Coronavirus vaccine is important for my health.
2. The Coronavirus vaccine is effective.
3. Getting the Coronavirus vaccine is important for the health of others in my community.
4. If you are young and healthy you do not need to the coronavirus vaccine.
5. New vaccines pose a greater risk than old ones.
6. The information regarding the Coronavirus vaccine expressed by the CDC is reliable and trustworthy.
7. Getting the Coronavirus vaccine is the best way to prevent the disease.
8. If a doctor told me to get the Coronavirus vaccine I would listen.
9. I am concerned about the serious and adverse side effects of the Coronavirus vaccine.
10. The reason I am concerned about the Coronavirus vaccine is because it was created very quickly.

### Part 2: Perceived Stress

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4. In the last month, how often have you felt confident about your ability to handle your personal problems?
5. In the last month, how often have you felt that things were going your way?
6. In the last month, how often have you found that you could not cope with all the things that you had to do?
7. In the last month, how often have you been able to control irritations in your life?
8. In the last month, how often have you felt that you were on top of things?
9. In the last month, how often have you been angered because of things that were outside your control?
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

### Part 3: General Conspiracy Beliefs

1. The government is involved in the murder of innocent citizens and/or well-known public figures and keeps this a secret.
2. The power held by heads of state is second to that of small unknown groups who really control world politics.
3. Secret organizations communicate with extraterrestrials but keep this fact from the public.
4. The spread of certain viruses and/or diseases is the result of the deliberate, concealed efforts of some organization.
5. Groups of scientists manipulate, fabricate, or suppress evidence in order to deceive the public.
6. The government permits or perpetrates acts of terrorism on its own soil, disguising its involvement.
7. A small, secret group of people is responsible for making all major decisions, such as going to war.
8. Evidence of alien contact is being concealed from the public.
9. Technology with mind-control capacities is used on people without their knowledge.
10. New and advanced technology which would harm current industry is being suppressed.
11. The government uses people as patsies to hide its involvement in criminal activity.
12. Certain significant events have been the result of the activity of a small group who secretly manipulate world events.
13. Some UFO sightings and rumours are planned or staged in order to distract the public from real alien contact.
14. Experiments involving new drugs or technologies are routinely carried out on the public without their knowledge or consent.
15. A lot of important information is deliberately concealed from the public out of self-interest.