COVID-19 conspiracy beliefs: Relations with anxiety, quality of life, and schemas

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ABSTRACT

Background: The COVID-19 pandemic has produced a worldwide mental health crisis. Conspiracy beliefs regarding the origin of COVID-19 are prevalent, however, mental health consequences and factors associated with the likelihood of endorsing COVID-19 conspiracy theories have not yet been examined. The current study examined predictors and mental health consequences of conspiracy beliefs.
Methods: Participants in Canada and the United States were surveyed via Amazon Mechanical Turk in April 2020 (*N* = 797), approximately one month after the WHO declared COVID-19 a pandemic, and again in May 2020 (*N* = 395).
Results: Approximately half of the sample (49.7%) believed at least one conspiracy theory. Greater Covid-19 conspiracy beliefs were associated with more anxiety at follow up but not quality of life. Religiosity/spirituality, not knowing someone at high-risk for COVID-19, and non-white ethnicity were associated with greater conspiracy beliefs. Lower positive other-schemas were associated with greater conspiracy beliefs, only at low and moderate levels of positive self-schemas.
Conclusions: There is substantial conspiracy belief endorsement during the COVID-19 pandemic and conspiracy beliefs are associated with anxiety, but not quality of life. Positive self-schemas protect against believing conspiracy theories and interventions to increase positive self-schemas may be effective to reduce the negative effects of conspiracy beliefs.

1. Introduction

Conspiracy beliefs are simple explanations for ambiguous or complex problems (Marchlewska et al., 2018), positing that powerful individuals or groups are deceiving the public (Freeman & Bentall, 2017). While conspiracy theories are not necessarily incorrect, they are typically not evidence-based and are resistant to contradictory evidence (Wood et al., 2012). Conspiracy theories often develop when individuals are experiencing an existential threat (Van Prooijen, 2020; Van Prooijen & Douglas, 2017) and in situations characterized by increased uncertainty, anxiety, and perceived lack of control (Bruder et al., 2013; Grzesiak-Feldman, 2013; Van Prooijen & Acker, 2015; Van Prooijen & Douglas, 2017; Van Prooijen & Jostmann, 2013; Whitson et al., 2015). Although conspiracy beliefs often develop as a method of increasing a sense of control and certainty (Douglas et al., 2017), it is also theorized that any benefits to conspiracy thinking are likely to be short-lived with longer-term negative effects (Freeman & Bentall, 2017). Conspiracy thinking

has been associated with negative emotions (Freeman & Bentall, 2017), increased social isolation (Freeman & Bentall, 2017), and anxiety (Grzesiak-Feldman, 2013).

The COVID-19 pandemic has created a global context that is ideal for the development of conspiracy theories. Uncertainty regarding the severity and duration of the pandemic, sustained threat with little control over the outcome, and governments enforcing widespread restrictions make it unsurprising that conspiracy theories about COVID-19 have circulated. Reports of COVID-19 conspiracy belief prevalence have been mixed early in the pandemic with some studies suggesting that approximately 50% of the population believe conspiracy theories (Freeman et al., 2020), while others have suggested the true prevalence is likely less than 25% (McManus et al., 2020; Sutton & Douglas, 2020). However, most of these studies have been conducted in the United Kingdom.

Most of the research on conspiracy beliefs during the pandemic has focused on the effect that conspiracy beliefs have on compliance with

governmental policies to reduce the spread of COVID-19, however, preliminary cross-sectional evidence has suggested that conspiracy beliefs also have a personal impact on the individual holding the belief and is associated with greater mental distress and anxiety (Chen et al., 2020). Quality of life is an indicator of a person's satisfaction with their everyday life that has not yet been examined with relation to COVID-19 conspiracy beliefs.

Although conspiracy beliefs appear to be prominent during the pandemic, few investigations have examined who is most likely to believe COVID-19 conspiracy theories. A report from the United Kingdom suggested that younger participants, participants of non-white ethnicity, and participants with less education were more likely to believe COVID-19 conspiracy theories (Freeman et al., 2020). A report using a global sample, found similarly more conspiracy beliefs among individuals with lower education, and also reported fewer conspiracy beliefs in countries that had been most substantially affected by COVID-19 (Georgiou et al., 2020). In addition to demographic factors, psychological models of conspiracy theories emphasize social cognitive factors in the development of conspiracy beliefs (Douglas et al., 2017). Schemas are social cognitive constructs, often representing views of the self or other people, that influence how information is processed. Individuals who find their positive self-schemas threatened are more likely to endorse conspiracy beliefs (Cichocka et al., 2016), as are individuals who feel that they have been victimized (Bilewicz et al., 2013). Thus, conspiracy beliefs may serve as a defensive response when positive self-schemas are threatened. Additionally, conspiracy beliefs have been linked to negative views of other people (Imhoff & Bruder, 2014; Kofta & Sedek, 2005), suggesting that negative schemas about others likely contribute to conspiracy beliefs. Despite theories that conspiracy beliefs develop when individuals hold negative views of both themselves and other people (Cichocka et al., 2016), the interaction between self- and other- schemas has never been examined. Additionally, the role of schemas in COVID-19 conspiracy beliefs have not yet been examined, despite presenting a potential point of intervention.

The current study had three primary aims. First, we examined the prevalence of COVID-19 conspiracy beliefs in a North American sample and longitudinal stability of conspiracy beliefs. Second, we examined the personal consequences of COVID-19 conspiracy beliefs on anxiety and quality of life. Lastly, we examined demographic and cognitive factors associated with greater likelihood of believing COVID-19 conspiracy theories.

2. Method

2.1. Participants and procedure

One-thousand participants were recruited via Amazon Mechanical Turk (MTurk), which has been validated for psychological research (Clifford et al., 2015) and results in samples that are more representative of community demographics than other sampling approaches (Cheung et al., 2017). Participants could access the survey if they had a Canadian or U.S.-based Internet protocol (IP) address and a 99% approval rating for prior MTurk tasks. Based on past research, it was expected that 20–25% of responses would be excluded due to insufficient effort on effort testing questions. An attrition rate of 50% was also expected between the baseline and follow-up surveys based on previous MTurk studies. Therefore, a baseline sample of 750 to 800 participants (after excluding participants with low effort) and an overall longitudinal sample of approximately 400 participants were expected, which is sufficient to detect small to moderate moderation effects based on simulation studies (Fritz & MacKinnon, 2007).

The baseline survey was administered via MTurk between April 21st and 25th, 2020, approximately one month after the World Health Organization (WHO) declared COVID-19 a pandemic (WHO, 2020) and the follow up survey was administered one month later between May 21st and 27th, 2020. Participants were compensated with $2 (USD) per survey and an additional $2 (USD) if participants passed the effort checks on both baseline and follow up surveys. Each participant gave written informed consent and all procedures were approved by the University of Toronto Research Ethics Board.

2.2. Measures

2.2.1. COVID-19 density

In order to control for exposure to the pandemic, a proxy variable of COVID-19 density was calculated as the number of confirmed COVID-19 cases per 1 million population. Density was calculated for each state (US) and province/territory (Canada) on April 23, 2020 (mid-point of the baseline survey).

2.2.2. Physical and mental health risk

Participants were presented with a list of 30 common physical health diagnoses and 6 common mental health diagnoses and asked to indicate whether they had been diagnosed with any of the conditions. Participants who indicated they had been diagnosed with two or more conditions in either category were considered at "high risk" for either physical health or mental health consequences from the pandemic. The same questions were asked regarding whether participants had a friend or family member who had been diagnosed with the listed conditions.

2.2.3. COVID-19 beliefs

In order to examine rates of conspiracy beliefs specifically about the cause of COVID-19, we developed a series of questions relating to commonly held COVID-19 conspiracy theories that were circulating at the beginning of the pandemic (April 2020). This self-report measure consists of 8 items (Table 1). Each item states a belief regarding the COVID-19 pandemic that was circulating on social media platforms at the time of the survey. Items are rated on a 5-point bipolar rating scale ranging from "0" (Disagree) to "4" (Agree). Items were examined individually and not combined into a total score, thus no measure of internal consistency was calculated.

2.2.4. Flexible inventory of conspiracy suspicions (FICS)

The FICS (Wood, 2016) is a 5-item self-report measure assessing conspiracy beliefs around any specific topic of interest. For the current study, questions were phrased with reference to the COVID-19 pandemic. The FICS was included as a validated measure that could be applied to COVID-19, however, the flexibility of the scale means that the items are less specifically related to popular COVID-19 conspiracy beliefs. Items are rated on a 5-point Likert-type scale from "1" (strongly disagree) to "5" (strongly agree) with higher scores indicating greater conspiracy beliefs surrounding the COVID-19 pandemic. Internal consistency was $\alpha = 0.91$ at baseline and $\alpha = 0.92$ at follow-up.

2.2.5. Generic conspiracist beliefs Scale-15 (GCB-15)

The GCB-15 (Brotherton et al., 2013) is a 15-item self-report measure assessing general conspiracy beliefs. The GCB-15 was included to measure individuals' general tendency to endorse conspiracy theories. Items are rated on a 5-point Likert-type scale with responses ranging from "1" (definitely not true) to "5" (definitely true), with higher scores indicating greater conspiracy beliefs. Internal consistency was $\alpha = 0.94$ at baseline and $\alpha = 0.95$ at follow-up.

2.2.6. World Health Organization quality of life – BREF (WHOQOL-BREF)

The WHOQOL-BREF (WHOQOL Group, 1998) is a 26-item self-report measure assessing quality of life across four domains: physical health (7 items), psychological (6 items), social relationships (3 items), and environment (8 items). Items are rated on a 5-point Likert-type scale with higher scores indicating higher quality of life. Items within each domain are averaged and the mean score is multiplied by 4 so that domain scores have a maximum score of 20. A total score is created by summing the domain scores. Internal consistency ranged from $\alpha = 0.91$

Table 1
Relation of COVID-19 beliefs to anxiety and quality of life.

COVID-19:		GAD-7			WHO-QOL-BREF		
	Agree n (%)	Agree M (SD)	Disagree M (SD)	t-stat	Agree M (SD)	Disagree M (SD)	t-stat
1. Is a virus that escaped from a laboratory	255 (32%)	6.78 (5.47)	6.37 (5.49)	0.98	58.48 (9.80)	58.72 (10.01)	0.32
2. Is a message from God	103 (13%)	8.58 (5.50)	6.19 (5.41)	4.17**	56.51 (8.75)	58.96 (10.06)	2.34
3. Is a bioweapon	206 (26%)	7.30 (5.59)	6.22 (5.42)	2.44	57.92 (9.50)	58.90 (10.07)	1.22
4. Is a way to push vaccines	126 (16%)	7.30 (5.57)	6.35 (5.46)	1.79	58.14 (9.08)	58.74 (10.09)	0.62
5. Is a conspiracy	100 (13%)	8.22 (5.77)	6.26 (5.40)	3.37*	57.82 (9.12)	58.78 (10.05)	0.89
6. Is a way to manage over population	146 (18%)	7.50 (5.74)	6.28 (5.40)	2.44	58.34 (10.27)	58.72 (9.86)	0.41
7. Was spread from animals to humans	528 (66%)	6.49 (5.39)	6.51 (5.66)	0.06	58.82 (9.70)	58.33 (10.40)	0.65
8. Is nobody's fault	234 (29%)	6.35 (5.65)	6.56 (5.42)	0.49	59.82 (9.50)	58.16 (10.08)	2.15

Note. Agree includes individuals who responded 'agree' or 'somewhat agree' to the Conspiracy Belief item. Disagree includes individuals who responded 'disagree,' 'somewhat disagree,' or 'neutral' to the Conspiracy Belief item. Group means and standard deviations are presented for both the GAD-7 and WHOQOL-BREF. GAD-7 = Generalized Anxiety Disorder-7 Item Scale; WHO-QOL-BREF = World Health Organization Quality of Life – BREF.

* $p < .006$ (family wise correction).

** $p < .001$.

to $\alpha = 0.93$.

2.2.7. Generalized anxiety Disorder-7 (GAD-7)

The GAD-7 (Spitzer et al., 2006) is a 7-item self-report measure assessing symptoms of generalized anxiety. Items are rated on a 4-point Likert-type scale ranging from "0" (not at all) to "3" (nearly every day) with higher scores indicating greater anxiety. Internal consistency was $\alpha = 0.92$ at baseline and $\alpha = 0.93$ at follow-up.

2.2.8. Brief core schema scale (BCSS)

The BCSS (Fowler et al., 2006) is a 24-item self-report measure assessing core schemas about the self and others and includes four domains: negative beliefs about the self, positive beliefs about the self, negative beliefs about others, and positive beliefs about others. Items are rated on a 5-point Likert-type scale from "0" (do not believe it) to "4" (believe it totally), with higher scores indicating stronger beliefs. Internal consistency for the four scales ranged from $\alpha = 0.89$ to 0.95 at baseline and $\alpha = 0.89$ to 0.96 at follow-up.

2.3. Data analysis

Missing data within scales were interpolated using participant mean replacement.

2.3.1. Aim 1: Prevalence and stability of COVID-19 conspiracy beliefs

Prevalence of the COVID-19 conspiracy beliefs at baseline were calculated as the percentage of participants who agreed with the belief (responses 'agree' or 'somewhat agree'). Stability of conspiracy belief endorsement across time points was examined in the completers sample with a McNemar test.

2.3.2. Aim 2: Mental health consequences of COVID-19 conspiracy beliefs

Anxiety and QOL were compared between participants who endorsed each COVID-19 conspiracy belief and those who did not endorse the belief using t-tests. To investigate whether conspiracy beliefs are associated with QOL, a hierarchical linear regression was conducted at baseline. Age, Covid-19 density, and gender were entered in the first step to control for differences by age, gender, and exposure to COVID-19; the FICS and GCB were entered in the second step to examine the effect of conspiracy beliefs on QOL. This same analysis was conducted with baseline variables predicting QOL at follow-up to assess longitudinal associations. To examine the direction of the relation between conspiracy beliefs and anxiety, a cross-lagged panel analysis was conducted with correlation coefficients presented for each relationship.

2.3.3. Aim 3: Factors associated with believing COVID-19 conspiracy theories

Relations between specific conspiracy beliefs on the FICS and general conspiracy beliefs on the GCB were examined with demographic characteristics using Pearson correlations and t-tests. To examine the relation between positive and negative self- and other- schemas with COVID-19 conspiracy beliefs, moderated regression analyses were conducted with schemas at baseline predicting FICS at both baseline and follow-up. Positive and negative schemas were examined independently in two separate regression analyses. The first analysis examined positive other-schemas as the independent variable (IV) and positive self-schemas as the moderator. The second analysis examined negative other-schemas as the IV and negative self-schemas as the moderator.

3. Results

3.1. Participants

One-thousand participants completed the baseline survey. 203 (20.3%) participants were excluded for answering more than one effort question incorrectly, resulting in a sample size of 797. Of these, 408 participants (51%) completed the survey again one month later. At follow-up, 13 individuals (3%) were excluded for incorrectly answering more than one effort question, resulting in a follow-up sample of 395. Two participants were missing data for baseline WHO-QOL-BREF and two participants did not indicate state of residence required to calculate COVID-19 density. Participants were retained in analyses for which they had complete data for. A participant flow diagram is presented in Fig. 1 and demographic characteristics of the baseline and longitudinal sample are presented in Table 2.

Compared to participants who did not complete the follow-up survey, participants who completed the follow-up survey were significantly older ($M = 30.80$, $SD = 10.09$; $M = 33.72$, $SD = 12.63$, respectively), had significantly lower scores on baseline GAD-7 ($M = 6.99$, $SD = 5.72$; $M = 6.01$, $SD = 5.19$), FICS ($M = 15.26$, $SD = 5.19$; $M = 13.02$, $SD = 5.34$), GCB ($M = 40.49$, $SD = 13.65$; $M = 36.76$, $SD = 13.74$), and BCSS negative other-schemas ($M = 7.81$, $SD = 6.02$; $M = 6.56$, $SD = 5.76$), and significantly higher scores on the WHO-QOL-BREF ($M = 57.86$, $SD = 9.76$; $M = 59.44$, $SD = 10.06$), $ps < 0.025$. Further, a greater proportion of the non-completer sample was American (96.7%) compared to completers (92.6%), $\chi^2(1) = 6.97$, $p = .01$. There were no other significant differences in demographic variables among completers versus non-completers.

3.2. Aim 1: Prevalence and stability of COVID-19 conspiracy beliefs

396 participants (49.7%) endorsed at least one conspiracy belief at

Enrollment

Assessed for eligibility (n=1000)

Excluded (n=203)
Did not pass effort questions (n=203)

Baseline

Completed baseline survey (n=797)

Excluded (n=389)
Did not complete follow-up survey (n=389)

Follow-up

Completed follow-up survey (n=408)

Excluded (n=13)
Did not pass effort questions (n=13)

Analysis

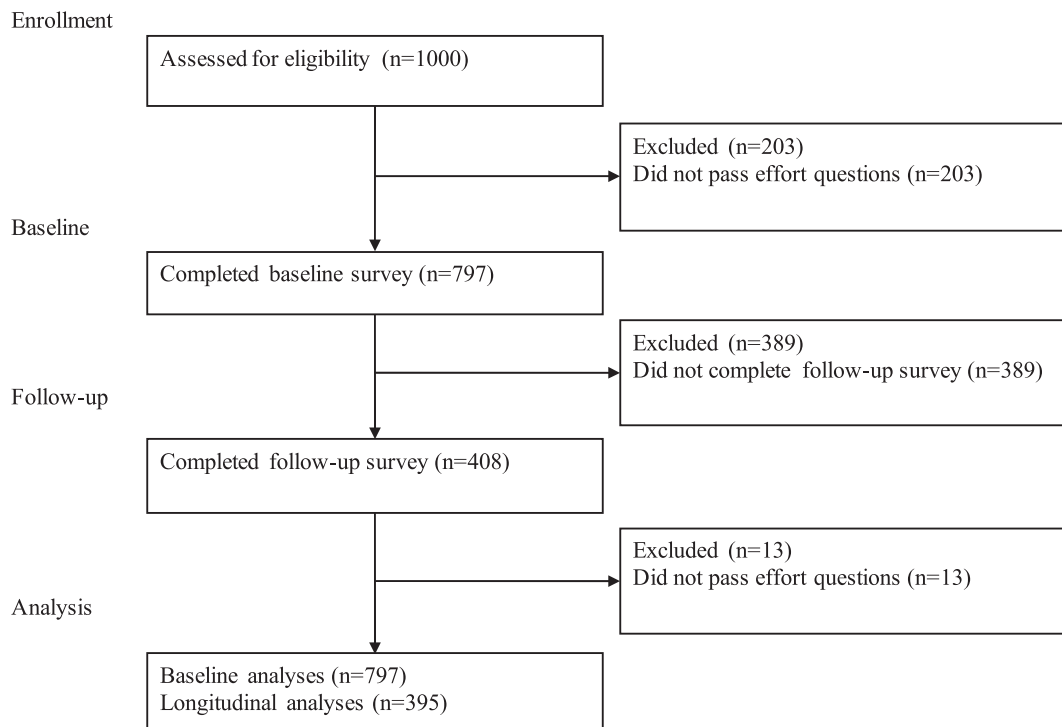Baseline analyses (n=797)
Longitudinal analyses (n=395)

Fig. 1. Participant flow diagram.

baseline. Frequencies of specific COVID-19 conspiracy beliefs are presented in Table 3. Conspiracy belief endorsement was stable across the one-month follow-up period with none of the COVID-19 beliefs demonstrating any significant change from baseline to follow-up (Table 3). Additionally, total score on the FICS was stable from baseline ($M = 13.02$, $SD = 5.34$) to follow-up ($M = 12.93$, $SD = 5.53$), $t(394) = 0.50$, $p = .619$. At baseline, the GCB and FICS demonstrated a high correlation, $r(795) = 0.61$, $p < .001$, suggesting that both measure conspiracy beliefs but that generic and COVID-19-specific beliefs also have distinguishable variance.

3.3. Aim 2: Mental health consequences of COVID-19 conspiracy beliefs

3.3.1. Quality of life

None of the specific COVID-19 conspiracy beliefs were associated with QOL (Table 1). After controlling for age, gender, and density of COVID-19 cases, GCB was associated with QOL at baseline, $ß = -0.12$, $t = -0.273$, $p = .007$ however, FICS was not, $ß = -0.03$, $t = -0.57$, $p = .570$. In the longitudinal model, neither GCB, $ß = -0.05$, $t = -1.15$, $p = .249$, nor FICS, $ß = -0.02$, $t = -0.51$, $p = .609$, at baseline were associated with QOL at follow-up.

3.3.2. Anxiety

More severe anxiety symptoms were associated with believing that COVID-19 is a message from God, and a conspiracy (Table 1). A cross-lagged panel analysis is presented in Fig. 2. GAD-7 and FICS were correlated with each other at baseline but not at follow-up. Additionally, baseline FICS was associated with GAD-7 at follow-up but not vice-versa, suggesting a directional relationship such that greater conspiracy belief endorsement leads to more severe anxiety.

3.4. Aim 3: Factors associated with believing COVID-19 conspiracy theories

3.4.1. Demographic factors

Age was not significantly correlated with FICS, $r(795) = -0.04$, $p = .274$, but did have a significant negative correlation with GCB, $r(793) =$

-0.08, $p = -0.021$, such that older age was associated with less endorsement of general conspiracy beliefs. Importance of religion/spirituality had a significant positive correlation with both FICS, $r(795) = 0.36$, $p < .001$, and GCB, $r(793) = 0.18$, $p < .001$, such that greater religiosity/spirituality was associated with greater endorsement of both general and COVID-specific conspiracy beliefs. There was also a significant difference in FICS score, $t(795) = 5.46$, $p < .001$, and GCB score, $t(793) = 4.23$, $p < .001$, between individuals who identified with white ethnicity ($M_{FICS} = 13.46$, $SD_{FICS} = 5.43$; $M_{GCB} = 37.23$, $SD_{GCB} = 13.51$) and individuals who identified with non-white ethnicities ($M_{FICS} = 15.59$, $SD_{FICS} = 5.00$; $M_{GCB} = 41.62$, $SD_{GCB} = 14.01$), such that individuals of non-white ethnicities endorsed greater general and COVID-specific conspiracy beliefs. There was no significant difference between men ($M = 13.88$, $SD = 5.42$) and women ($M = 14.41$, $SD = 5.36$) on FICS, $t(790) = -1.36$, $p = .173$, and no significant difference between men ($M = 37.91$, $SD = 13.64$) and women ($M = 39.28$, $SD = 14.01$) on GCB, $t(788) = -1.38$, $p = .167$.

FICS was significantly lower for individuals who knew someone at high-risk for complications from COVID-19 ($M = 13.41$, $SD = 5.56$) than individuals who did not know someone at high-risk for complications ($M = 14.85$, $SD = 5.12$), $t(795) = 3.78$, $p < .001$. However, GCB did not significantly differ as a function of whether individuals knew someone at high-risk for complications ($M = 38.38$, $SD = 13.78$) or not ($M = 38.90$, $SD = 13.86$), $t(793) = 0.528$, $p = .597$. There was no significant difference in FICS, $t(795) = 0.874$, $p = .382$, nor GCB, $t(793) = -0.077$, $p = .939$, between individuals with two or more self-reported physical health conditions ($M_{FICS} = 13.76$, $SD_{FICS} = 5.48$; $M_{GCB} = 38.74$, $SD_{GCB} = 14.38$) and individuals with fewer than two physical health conditions ($M_{FICS} = 14.23$, $SD_{FICS} = 5.37$; $M_{GCB} = 38.63$, $SD_{GCB} = 13.72$). General conspiracy belief endorsement was significantly greater in individuals with two or more mental health disorders ($M = 41.91$, $SD = 14.46$) than individuals with less than two mental health disorders ($M = 38.09$, $SD = 13.64$), $t(793) = -2.77$, $p = .006$. However, FICS scores did not significantly differ between individuals with two or more mental health disorders ($M = 13.91$, $SD = 5.52$) and individuals with less than two mental health disorders ($M = 14.20$, $SD = 5.36$), $t(795) = 0.54$, $p = .589$.

Table 2
Demographic characteristics of the cross-sectional and longitudinal samples.

	Cross-Sectional ($N = 797$)	Longitudinal ($n = 395$)
Age, M years (SD)	32.2 (11.5)	33.7 (12.6)
Country of residence, n(%)		
USA	755 (94.7)	366 (92.7)
Canada	42 (5.3)	29 (7.3)
Gender, n(%)		
Male	357 (44.8)	173 (43.8)
Female	435 (54.6)	220 (55.7)
Non-binary	3 (0.4)	2 (0.5)
Two-spirit	2 (0.3)	0 (0.0)
Race/ethnicity, n(%)		
White	538 (67.5)	274 (69.4)
Black	66 (8.3)	28 (7.1)
Multiracial	52 (6.5)	26 (6.6)
Latin American	49 (6.1)	21 (5.3)
South Asian	36 (4.5)	20 (5.1)
Chinese	22 (2.8)	11 (2.8)
Southeast Asian	11 (1.4)	7 (1.8)
Filipino	8 (1.0)	3 (0.8)
Korean	4 (0.5)	1 (0.3)
West Asian	3 (0.4)	1 (0.3)
Indigenous	2 (0.3)	1 (0.3)
Arab	2 (0.3)	1 (0.3)
Japanese	2 (0.3)	1 (0.3)
Other	2 (0.3)	0 (0.0)
Current relationship status, n (%)		
Single	304 (38.1)	150 (38.0)
Partnered	158 (19.8)	75 (19.0)
Married	297 (37.3)	149 (37.7)
Separated/divorced	33 (4.1)	20 (5.1)
Widowed	5 (0.6)	1 (0.3)
Yearly household income, n (%)		
$0 - $10,000	65 (8.2)	30 (7.6)
$10,001 - $20,000	56 (7.0)	25 (6.3)
$20, 001 - $30,000	92 (11.5)	42 (10.6)
$30,001 - $50,000	139 (17.4)	69 (17.5)
$50,001 - $70,000	150 (18.8)	72 (18.2)
$70,001 - $100,000	134 (16.8)	79 (20.0)
$100,001 - $150,000	111 (13.9)	51 (12.9)
$150,001 +	50 (6.3)	27 (6.8)
Highest level of education, n (%)		
Less than high school	9 (1.1)	3 (0.8)
High school graduate	204 (25.6)	87 (22.0)
College certificate or diploma	94 (11.8)	47 (11.9)
Bachelor's degree	350 (43.9)	182 (46.1)
Master's degree	116 (14.6)	61 (15.4)
Doctorate	24 (3.0)	15 (3.8)
Currently working (% YES)	495 (62.1)	254 (64.3)

3.4.2. Cognitive schemas

There was a significant interaction between positive self- and positive- other schemas in predicting FICS at baseline, $F(1,793) = 5.29$, $p = .022$ (Fig. 3). At high levels of positive self-schemas, positive other schemas were not related to FICS, $\beta = -0.08$, $p = .112$, but at low levels of positive self-schemas, positive other schemas were negatively related with FICS, $\beta = -0.22$, $p < .001$. There was also a significant interaction between negative self- and negative other- schemas in predicting FICS at baseline, $F(1,793) = 7.75$, $p = .006$ (Fig. 3). At high levels of negative self-schemas, negative other-schemas were associated with higher FICS, $\beta = 0.32$, $p < .001$. At low levels of negative self-schemas, negative other-schemas were still associated with FICS but to a lesser degree, $\beta = 0.13$, $p = .008$. There was no significant interaction between positive schemas, $F(1,391) = 0.72$, $p = .395$, or negative schemas, $F(1,391) = 3.44$, $p = .064$, in predicting FICS longitudinally.

Table 3
Stability of COVID-19 beliefs from baseline to follow-up.

COVID:	Baseline ($n = 395$) Agree, n (%)	Follow-up ($n = 395$) Agree, n (%)	McNemar statistic
1. Is a virus that escaped from a laboratory	108 (27%)	97 (25%)	$\chi^2(1) = 1.70$, $p = .193$
2. Is a message from God	41 (10%)	36 (9%)	$\chi^2(1) = 0.52$, $p = .472$
3. Is a bioweapon	82 (21%)	70 (18%)	$\chi^2(1) = 2.88$, $p = .090$
4. Is a way to push vaccines	42 (11%)	50 (13%)	$\chi^2(1) = 1.02$, $p = .312$
5. Is a conspiracy	41 (10%)	38 (10%)	$\chi^2(1) = 0.11$, $p = .742$
6. Is a way to manage over population	58 (15%)	46 (12%)	$\chi^2(1) = 2.52$, $p = .112$
7. Was spread from animals to humans	273 (69%)	279 (71%)	$\chi^2(1) = 0.35$, $p = .556$
8. Is nobody's fault	132 (33%)	127 (32%)	$\chi^2(1) = 0.19$, $p = .661$

Note. Agree includes responses 'agree' and 'somewhat agree' to the item.

4. Discussion

The present study examined prevalence of conspiracy beliefs relating to COVID-19, mental health consequences, and factors associated with believing conspiracy theories. This is the first study that we know of to examine this question in a North American sample, and to examine COVID-19 conspiracy beliefs longitudinally.

Approximately half (49.7%) of the current sample believed at least one COVID-19 conspiracy theory, which is consistent with other reports during the COVID-19 pandemic (Freeman et al., 2020). Sutton and Douglas (2020) criticized the use of a unipolar scale by Freeman et al. (2020) and found that when a bipolar scale was used with equal numbers of positive and negative response options, estimates of conspiracy belief endorsement were similar to that reported prior to the pandemic (Freeman & Bentall, 2017). Despite using bipolar scaling, we found comparable rates of conspiracy belief endorsement to Freeman et al. (2020). The time at which the study was conducted may have determined the extent of conspiracy belief endorsement. Our study (baseline late April 2020) was conducted at a similar time as Freeman et al. (2020) (May 2020) whereas Sutton and Douglas (2020) collected data in late June. It is possible that endorsement was greatest early in the pandemic and has since decreased. Although, our longitudinal data suggests that conspiracy belief endorsement was stable over the month of May 2020, it is possible that longer term follow-up might reveal a decreasing trend for conspiracy beliefs.

The current results also provide evidence for negative mental health consequences associated with conspiracy beliefs. Conspiracy beliefs at baseline were associated with anxiety at follow-up, but not vice-versa, suggesting that believing conspiracy theories may lead to increased anxiety. This is consistent with previous ideas that although conspiracy beliefs may develop as a mechanism to reduce anxiety about the unknown, the content of the conspiracy belief itself may increase anxiety (Douglas et al., 2017). It appears that conspiracy theories surrounding COVID-19 may be exacerbating the anxiety that a pandemic is naturally expected to elicit (Holmes et al., 2020). The substantial proportion of the population endorsing conspiracy beliefs (~50%) is also concerning, given the effects that conspiracy beliefs have on mental health. Future research could examine methods to effectively reduce conspiracy beliefs at both the societal and individual levels.

COVID-19 specific conspiracy beliefs did not predict poorer QOL during the pandemic. General conspiracy beliefs were associated with QOL at baseline (but not longitudinally), suggesting a relationship between the general propensity to endorse conspiracy beliefs and QOL,
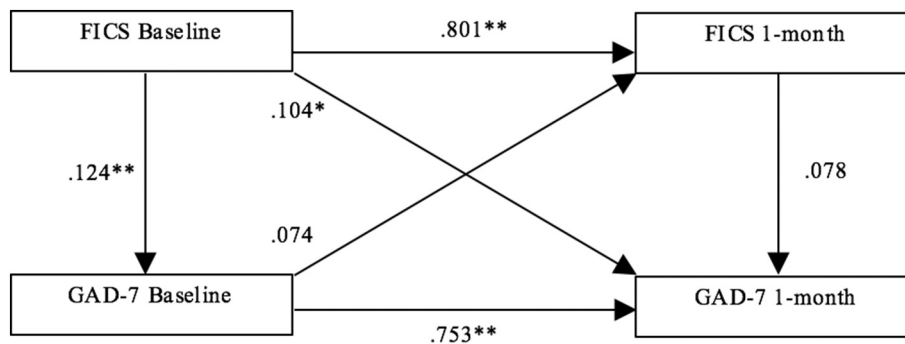
Fig. 2. Cross-lagged panel correlation analysis of anxiety and COVID conspiracy beliefs.
Note. Cross-lagged panel analysis of GAD-7 and FICS at baseline and one-month follow-up. Pearson correlation coefficients are presented. GAD-7 = Generalized Anxiety Disorder-7 Item Scale; FICS = Flexible Inventory of Conspiracy Suspicions. $*p < .05$, $**p < .01$.
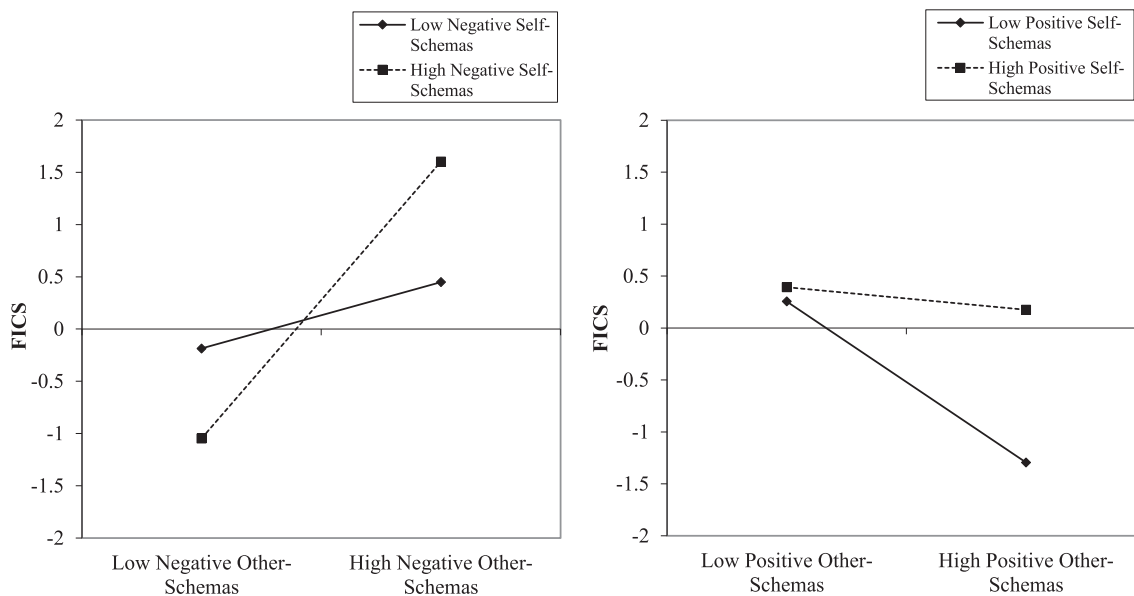

Fig. 3. Baseline relations of other- schemas to conspiracy beliefs at levels of positive and negative self- schemas.

however, the direction of this relationship remains unclear. The lack of relationship between COVID-19 specific conspiracy beliefs and QOL, may suggest that while believing COVID-19 conspiracy theories increases anxiety, it does not translate to changes in QOL. However, future studies should examine this relationship with a longer-term follow-up.

Individuals who reported greater religiosity/spirituality were more likely to endorse conspiracy beliefs, as were individuals who were of a non-white ethnicity. Future research should examine cultural factors associated with believing conspiracy theories. Individuals were also more likely to endorse COVID-19 conspiracy beliefs if they did not know anyone who was at high-risk for health complications from COVID-19. Knowing someone at high-risk may make COVID-19 a more legitimate threat, reducing the likelihood of believing conspiracy theories.

From a cognitive perspective, the current results suggest that individuals are most likely to believe conspiracy theories when they hold negative schemas about both themselves and others. Positive self-schemas appear to mitigate the effects of schemas about other people, thus, one therapeutic approach to working with people who hold distressing conspiracy beliefs may be to develop stronger positive self-schemas. Numerous therapeutic approaches, such as cognitive-behavioural therapy and compassion focused therapy, can effectively strengthen positive self-schemas and may be worth considering as individual intervention options.

The current results should be interpreted with consideration of

several limitations. Due to the requirement that participants be proficient in the use of technology to access the MTurk platform, the results may not generalize to people who are not technologically adept. However, several studies have also suggested that MTurk produces samples that are more representative of the general population than other comparable sampling approaches (Cheung et al., 2017; Clifford et al., 2015), thus it may be a reasonable representation of the population. The online nature of this survey limited the types of measures that could be used to those that are self-reported, which are vulnerable to social desirability biases, demand characteristics, and effort. However, we used a rigorous approach of embedded effort-testing questions to ensure that participants were actively attending to questions. Additionally, the longitudinal nature of this study is a significant strength, however, the 1-month follow-up period may not have been long enough to detect substantial changes in the examined variables. Studies with longer follow-up may be necessary to appropriately characterize change in these factors during the pandemic.

5. Conclusion

The current study found high rates of COVID-19 conspiracy belief endorsement in a North American sample. Conspiracy beliefs were associated with anxiety and greater endorsement of conspiracy beliefs at baseline were associated with greater anxiety at follow-up. Negative

self- and other- schemas were associated with more conspiracy beliefs, and positive self-schemas were protective against believing conspiracy theories. Thus, conspiracy theories are prevalent during the COVID-19 pandemic and are associated with reduced well-being. Societal and individual methods of reducing belief in conspiracy theories may be helpful to improve wellbeing during the pandemic.

CRediT authorship contribution statement

TL, ALS, and MWB designed the study. RR was responsible for data collection. TL and MWB analyzed the data. TL wrote the first draft, while ALS, RR, and MWB provided comments. All authors approved the final draft of the manuscript.

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