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# Worry, avoidance, and coping during the COVID-19 pandemic: A comprehensive network analysis

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ABSTRACT

*Background:* Many psychological factors play a role in the COVID-19 pandemic, including various forms of worry, avoidance, and coping. Adding to the complexity, some people believe the threat of COVID-19 is exaggerated. We used network analysis to investigate how these diverse elements are interrelated.
*Methods:* A population-representative sample of 3075 American and Canadian adults completed an online survey, including measures of COVID-19-related worry, avoidance, self-protective behaviors, and other variables.
*Results:* The network contained three major hubs, replicated across gender and age groups. The most important hub centered around worries about the dangerousness of COVID-19, and formed the core of the previously identified COVID Stress Syndrome. The second most important hub, which was negatively correlated with the first hub, centered around the belief that the COVID-19 threat is exaggerated, and was associated with disregard for social distancing, poor hand hygiene, and anti-vaccination attitudes. The third most important hub, which was linked to the first hub, centered around COVID-19-related compulsive checking and reassurance-seeking, including self-protective behaviors such as panic buying and use of personal protective equipment.
*Conclusion:* Network analysis showed how various forms of worry, avoidance, coping, and other variables are interrelated. Implications for managing disease and distress are discussed.

## 1. Introduction

Recent conceptualizations of COVID-19-related distress have tended to be narrow, focusing largely on single-variable models, such as those focusing on the fear of infection (e.g., Ahorsu et al., 2020; Mertens, Gerristen, Salemink, & Engelhard, 2020). In contrast, research and clinical observations from previous pandemics and other outbreaks suggest that the scope of relevant variables is much broader, including seemingly contradictory elements (e.g., fear of infection along with beliefs that the seriousness of the outbreak has been exaggerated), combined with various, possibly interacting variables such as numerous types of worry, avoidance, and coping responses (Taylor, 2019). Similarly, a growing body of research reveals that the psychological responses to the COVID-19 pandemic are complex, with numerous interconnected factors at work (e.g., Taylor, Landry, Paluszek, & Asmundson, 2020, 2020b, 2020c, Taylor, Landry, Rachor, Paluszek, & Asmundson, 2020d).

In our previous research we found that five of these elements are closely interrelated, forming a network of variables called the COVID Stress Syndrome (Taylor et al., 2020b, c). These variables are (1) worry about the dangerousness of COVID-19 and about coming into contact with fomites (i.e., objects, surfaces) potentially contaminated with SARSCoV2, (2) worry about the socioeconomic consequences of COVID-19 (e.g., worry about personal finances, worry about disruption in the supply chain), (3) xenophobic fears that foreigners are spreading SARSCoV2, (4) traumatic stress symptoms associated with direct or vicarious traumatic exposure to COVID-19 (i.e., COVID-19-related nightmares, intrusive thoughts or images), and (5) COVID-19-related compulsive checking and reassurance-seeking (Taylor et al., 2020b, c).

The foundational work on COVID Stress Syndrome and other studies (e.g., Taylor et al., 2020a, d) suggest that several other variables are relevant to understanding the psychology of COVID-19. These variables, and their corresponding measures, are presented in Table 1. This is not an exhaustive list of relevant factors, but rather is a list of variables that

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**Table 1**
Variables and their corresponding scales used in the network analysis.

| Variable (and scale) | No. of items | McDonald's ω | Sample item |
|---|---|---|---|
| Anti-vaccination attitudes toward a SARSCoV2 vaccine | 12 | 0.93 | I would worry that there could be problems with a COVID-19 vaccine that have not yet been discovered |
| Belief in COVID-19-related conspiracy theories | 3 | 0.90 | COVID-19 was deliberately released in order to deal with the problem of over-population |
| Belief that one has robust physical health against COVID-19 | 3 | 0.91 | If I was infected, I would experience only mild symptoms |
| Belief that the threat of COVID-19 has been exaggerated | 3 | 0.89 | The dangerousness of COVID-19 has been exaggerated by the media |
| COVID-19-related avoidance of supermarkets and drug stores | 2 | 0.94 | During the past 7 days, how much have you avoided the following because of concerns about catching the COVID-19 coronavirus or some other disease? |
| CSS: COVID-19-related compulsive checking and reassurance-seeking | 6 | 0.90 | Sought reassurance from friends or family about COVID-19 |
| CSS: COVID-19-related traumatic stress symptoms | 6 | 0.96 | Disturbing mental images about the virus popped into my mind against my will |
| CSS: Worry about the dangers of COVID-19 and worry about coming into contact with SARSCoV2-contaminated fomites | 12 | 0.96 | I am worried about catching the virus |
| CSS: Worry about the personal socio-economic impact of COVID-19 | 6 | 0.94 | I am worried about grocery stores running out of food |
| CSS: Xenophobic worries that foreigners are spreading COVID-19 | 6 | 0.96 | I am worried that foreigners are spreading the virus because they're not as clean as we are |
| Disregard for social distancing | 3 | 0.88 | If I was infected, it would be no big deal if I went out and socialized with friends |
| Fear and avoidance of healthcare workers | 8 | 0.93 | For the safety of the community, healthcare workers should not go out in public |
| Pandemic-related altruism | 8 | 0.92 | I have contacted my neighbours to see if they need support |
| Practice of hand and cough hygiene | 4 | 0.77 | Do you try to avoid touching your face (e.g., not rubbing your eyes) so as to limit your exposure to COVID-19? |
| Stockpiling and panic buying | 5 | 0.89 | Have you stockpiled a large amount (i.e. more than a two-week supply) of food in the event that you have to go into self-isolation? |
| Use of personal protective equipment | 6 | 0.87 | During the past 7 days, how often have you worn the following outside of your home because of concerns about catching the COVID-19 coronavirus or some other disease? |

CSS = COVID Stress Scales.

have appeared promising in understanding the psychology of COVID-19 based on extant research. Previous research has been primarily piecemeal and preliminary in nature, investigating how small sets of variables are related to one another (e.g., Taylor et al., 2020a, d). The purpose of the present study was to extend this work by investigating how all 16 of the variables in Table 1 are related to one another. To accomplish this task, we conducted a comprehensive network analysis. To our knowledge, this is the first study to investigate how the elements in Table 1 are interconnected with one another.

Network analysis provides important information about relationships among elements in a network (e.g., symptoms in a syndrome or patterns of coping behaviors). Network analysis assumes that nodes (e.g., symptoms, factors, or other psychopathological features) cluster together because they are, in some way, causally linked with one another. In network analysis, the links are known as "edges." The presence of significant links does not assume that nodes are influenced by some underlying factor such as a latent variable. Instead, network analysis assumes that nodes may directly influence one another (Epskamp, Borsboom, & Fried, 2018). If nodes causally influence one another, then changes in a central node are most likely to lead to changes in other nodes in the network through a spreading of activation. Central nodes, as compared to peripheral nodes, are defining features of a network. Identifying central nodes has the potential to inform which elements to target in interventions. As a caveat, note that network analyses in cross-section designs such as the present study are suggestive of, but do not establish causality. Significant edges might represent causal influences (either unidirectional or directional) but experimental designs are needed to establish causality. Accordingly, network analyses provide a source of hypotheses about causal links among variables in a network.

From the perspective of cognitive-behavioral approaches to health anxiety, pandemics, and trauma-related fears (e.g., Taylor, 2017, 2019; Taylor & Asmundson, 2004), a network approach makes good theoretical sense because cognitive-behavioral models predict that the elements in the network would interact with one another. According to cognitive-behavioral models, negative beliefs (e.g., worry about COVID-19 infection and its sources and consequences) lead to COVID-19-related checking for information that can make the threat more predictable and controllable. Checking, in turn, can exacerbate worries about the dangerousness of COVID-19, because checking (e.g., checking for health-related information on the Internet or on social media) inevitably backfires, leading the person to encounter new, fear-evoking information (e.g., graphic images or descriptions of sick people on the mainstream news or social media; fake news and conspiracy theories about the dangers of contagion), which in turn amplify worries (Taylor & Asmundson, 2004; Taylor et al., 2020c; Taylor, 2019). Exposure to graphic information can also lead to traumatic stress symptoms, such as nightmares and intrusive thoughts and images. In turn, reexperiencing symptoms can increase the perceived threat, because reexperiencing provides vivid reminders of the dangerousness of COVID-19.

An unanswered question is how the elements of the COVID Stress Syndrome are related to other COVID-19-related psychological factors, such as beliefs that the threat of COVID-19 has been exaggerated, the disregard for social distancing, the use of personal protective equipment (PPE), anti-vaccination attitudes towards a SARSCoV2 vaccine, and conspiratorial beliefs about COVID-19 (e.g., belief that the novel coronavirus was deliberately manufactured as a bioweapon). Network analysis provides a basis for understanding how all of these variables are interrelated to one another.

## 2. Method

### 2.1. Sample and data collection procedures

Data were collected during May 6–19, 2020, from a population-

representative sample 3075 adults from the United States (n = 1496) and Canada (n = 1579) using an internet-based self-report survey delivered in English by Qualtrics, a commercial survey sampling and administration company.

Qualtrics solicited this sample as part of our previous investigations (Taylor et al., 2020b, c) and participants in the present study completed a more extensive battery of measures than that administered in our previous research. Filters were used to eliminate data from careless or incomplete responders. Embedded in the assessment battery were four attention-check items (e.g., "This is an attention check, please select Strongly Agree"; "For our research, it is really important that you paid attention while responding to our survey. How attentive were you when responding?": "Very Inattentive" to "Very Attentive"). Participants were included only if they provided correct responses to three or more of the four attention checks (e.g., 'Strongly agree' or 'Very attentive'), indicating that they were sufficiently attentive. In addition, at the end of the assessment battery, participants were asked to indicate whether, in their honest opinion, we should use their data. Those who responded "no" were excluded from data analysis, regardless of their score on the attention-check items. In terms of response completion, incomplete item responses were rare (< 5% per scale). Missing data were imputed via expectation-maximization.

Stratified random sampling was used to obtain a population-representative sample. Qualtrics maintains a pool of potential participants who have agreed to be contacted in order to respond to surveys. Qualtrics selected and contacted participants to meet sampling quotas based on age, gender, ethnicity, socioeconomic status, and geographic region within each country. Quotas were derived from census data from each country. Accordingly, the participants in this study were population-representative in terms of the above-mentioned demographic variables. Note that in terms of age (M = 51 years, SD = 14 years, range 18–94 years), the sample is population representative of *adults* (≥18 years), which were the focus of the study. A total of 51 % of the sample were female, most (91 %) were employed full- or part-time, and most (82 %) had completed full or partial college. Most (63 %) were Caucasian, with the remainder being Asian (14 %), African American/Black (10 %), Latino/Hispanic (7%), or other (5%). Only 2% of the sample reported being diagnosed with COVID-19.

All respondents provided written informed consent prior to completing the survey. The research described in this article was approved by the Research Ethics Board of the University of Regina (REB# 2020-043).

### 2.2. Measures

Participants completed a battery of measures, including demographic questions and the 16 scales presented in Table 1, which were used to derive the 16 variables for network analysis. For each of these scales, McDonald (1999) ω total, which is a commonly used alternative to Cronbach's α, was used as the measure of reliability as internal consistency. McDonald's ω was used instead of Cronbach's α because the latter tends to underestimate reliability (McNeish, 2018). Values of ω are interpreted in the same way as α; that is, values in the range of .70-.80 indicate acceptable reliability, .80-.90 are good, and values greater than .90 are excellent. Table 1 shows that the scales generally had good-to-excellent reliabilities, as assessed in the present data. Further details of the scales are as follows.

COVID Stress Syndrome was assessed by the five COVID Stress Scales (listed in Table 2), which have very good reliability and validity (Taylor et al., 2020b). Avoidance of essential stores (i.e., supermarkets and drug stores) and the fear and avoidance of healthcare workers were assessed by two scales developed as part of a study on healthcare worker stigma (Taylor et al., 2020d). Belief in COVID-19 conspiracy theories and stockpiling and panic buying were assessed by a scale developed in a previous study on the COVID Stress Syndrome (Taylor et al., 2020c). Belief that the dangerousness of COVID-19 is exaggerated, disregard for social distancing, belief that one has robust personal health against infection, and use of PPE were assessed with scales developed in a previous study on adherence to social distancing (Taylor et al., 2020a). The practice of hand and cough hygiene was assessed by a scale devised for the present study, as was the measure of pandemic-related altruistic behaviors. Anti-vaccination attitudes were measured using an adapted version of the Vaccination Attitudes Examination Scale (Martin & Petrie, 2017), assessing vaccination attitudes specific to SARS-CoV2. The items in this scale assess mistrust of vaccine benefit, worries over unforeseen future effects of the vaccine, concerns about commercial profiteering from the vaccine, and preference for natural immunity.

### 2.3. Statistical procedures

Glasso networks (regularized partial correlation networks) were computed using the R *qgraph* package (Epskamp, Maris, Waldorp, & Borsboom, 2016). The indices of centrality, also calculated with *qgraph*, were used to assess the nature of the connections between nodes (elements) in the network. Three indices of interconnectedness were calculated (Epskamp, Cramer, Waldorp, Schmittmann, & Borsboom, 2012): Strength, betweenness, and closeness. The strength of a given node is computed as the sum of the absolute values of the weights (regularized partial correlations) connecting that node with other nodes. A central node is one that has the largest number of statistically significant links to other nodes in the network. Strength was used as the primary indicator of centrality, given that it has the most support as a stable and reliable indicator of centrality (Epskamp et al., 2018). Betweenness refers to how often a given node in the network is the most efficient (shortest) path between other nodes; that is, how important a given node is in connecting other nodes with one another. Closeness refers to how well a node is connected to other nodes in the network. Node centrality difference tests (i.e., statistical test to determine whether nodes in the network are significantly more central than other nodes) were performed using the R package *bootnet*, which tests for differences in node strength (Epskamp et al., 2016). The stability (reliability) of the strength values for the nodes and their links was tested by the Correlation of Stability coefficient, also calculated via *bootnet* (Epskamp et al., 2018).

## 3. Results

Fig. 1 shows the links (regularized partial correlations) between nodes in the network (for all links, $p < .003$). The magnitude of the strength of connections among nodes is indicated by shorter, thicker lines, with positive associations in green and negative associations in red. The numerical values of the regularized partial correlations are presented in Supplement 1. For the network, the Correlation of Stability coefficients were 0.75 for both the nodes and the strength of the links between nodes. These values exceed the cutoff of 0.50 (Epskamp et al., 2018), suggesting that the values of the nodes and their links are stable (reliable).

Fig. 2 shows the centrality indices. Across all three indices, worry about the dangerousness of COVID-19 was the central hub in the network, with its strength of association with other nodes being significantly higher than the strengths of all other nodes (*ps*<.001). Fig. 2 also shows that the nodes with the next highest value in terms of strength was the belief that the COVID-19 threat is exaggerated. The strength of this node was significantly higher than those of the remaining nodes in the network (*ps*<.005). The third strongest node in the network was COVID-19-related checking and reassurance-seeking. The strength of this node was significantly higher than those of the remaining nodes (*ps*<.005). Thus, the results indicate that there are three major hubs in the network, including (1) worry about the dangerousness of COVID-19, (2) belief that the COVID-19 threat is exaggerated, and (3) COVID-19-related compulsive checking and reassurance-seeking. As shown in Fig. 1, the hubs were connected in some ways with one another—particularly the

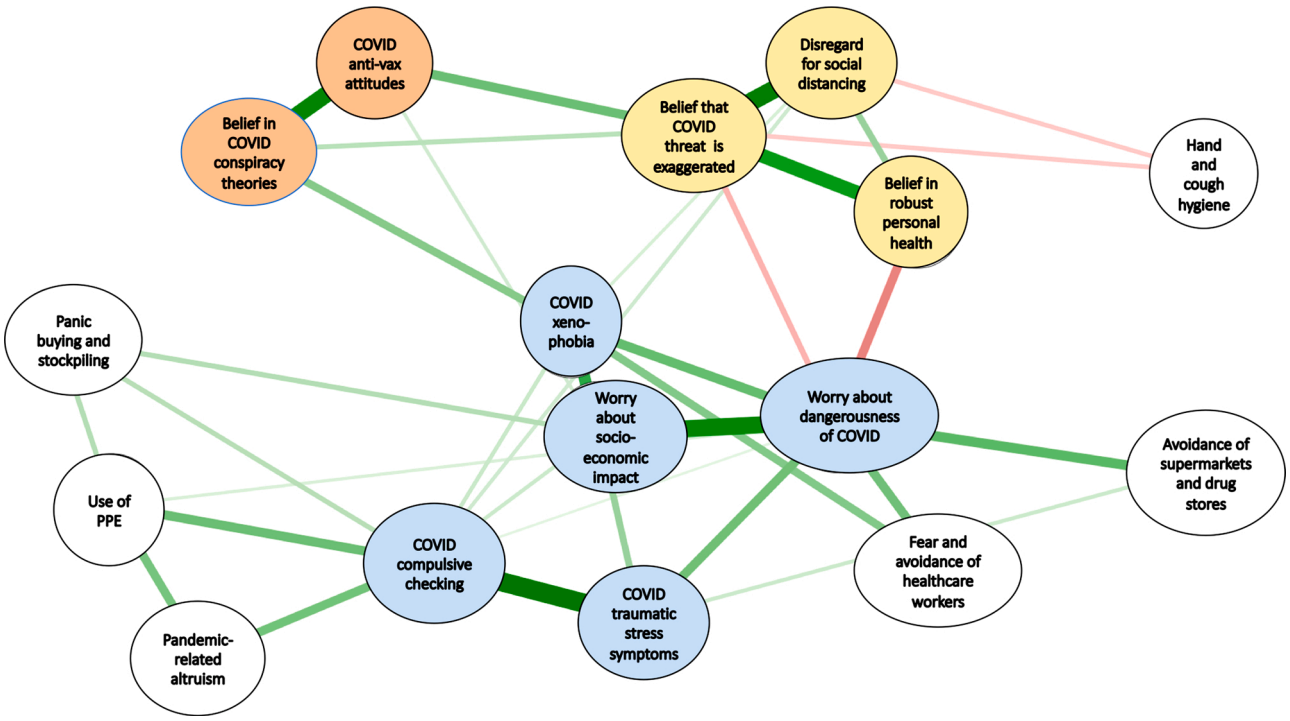


**Fig. 1.** Network analysis: Strength of interconnections (regularized partial correlations) among the elements in the network (green = positive and red = negative connections). Stronger connections are indicated by shorter and thicker lines. Only significant ($p < .01$) connections are shown (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).

danger and checking hubs—but also had unique patterns of network connections. In terms of associations between hubs, Fig. 1 shows that the blue ellipses defining the COVID Stress Syndrome were all interconnected with one another, which is consistent with our previous network analysis of this syndrome (Taylor et al., 2020c). At the periphery of the network there were several other variables that were linked to the COVID Stress Syndrome, including (1) avoidance of supermarkets and drug stores, (2) fear and avoidance of healthcare workers, (3) panic buying and stockpiling, and (4) use of PPE.

Regarding the hub defined by the belief that the COVID-19 threat has been exaggerated, Fig. 1 shows that this hub was associated with (1) disregard for social distancing, and (2) belief in robust personal health (yellow ellipses). This hub was also associated with anti-scientific or science skeptical beliefs; that is, anti-vaccination attitudes regarding a SARSCoV-2 vaccine, and belief in conspiracy theories regarding COVID-19 (orange ellipses). As shown in Fig. 1, the belief that the COVID-19 threat is exaggerated was also negatively associated with the practice of hand and cough hygiene.

With few exceptions, the links among elements in the network are consistent with cognitive-behavioral conceptualizations of health anxiety, pandemics, and posttraumatic stress symptoms (2019, Taylor & Asmundson, 2004; Taylor, 2017). For example, beliefs about the dangerousness of COVID-19 were linked to various types of fear and avoidance. Beliefs that the COVID-19 threat is exaggerated were also associated with poor adherence to hand hygiene and social distancing. There were, however, two unexpected, but comparatively weak, links. The first was the link between pandemic-related altruism and COVID-19-related compulsive checking and reassurance-seeking. The second was the comparatively weaker link between disregard for social distancing and COVID-19-related compulsive checking and reassurance-seeking. The replicability and relevance of these unexpected links remains to be determined. With these two exceptions, the results show that the overwhelming majority of links in the network (32/34 or 94 %) were consistent with cognitive-behavioral formulations.

To what extent do these findings generalize across different demographic groups? Network analytic methods for conducting such comparisons have not yet been fully developed, and there are limited means of comparing groups of people for a given network, especially when groups differ in sample size (Epskamp & Fried, 2018). We conducted preliminary analyses to determine whether the main network findings generalize across genders and age groups. Our sample of 3075 respondents was partitioned in various ways so as to conduct network analysis for each of the following five demographically-defined groups: Females ($n = 1564$), males ($n = 1511$), young adults (18–39 years, $n = 762$), middle aged adults (40–59 years, $n = 1373$), and older adults (60+ years, $n = 940$). For each dataset the Coefficient of Stability was >.74 for node strength and >.67 for edges. For each dataset, worry about the dangerousness of COVID-19 was the strongest node ($p < .001$). The second strongest node across all datasets was belief that the COVID-19 threat had been exaggerated, which was stronger than or equal in strength to the third strongest node, which was COVID-19-related checking and reassurance-seeking. These results are consistent with findings from the overall dataset.

## 4. Discussion

Many psychological factors play a role in the COVID-19 pandemic, including various forms of worry, avoidance, and coping. Adding to the complexity, some people believe the threat of COVID-19 is exaggerated. Yet, recent conceptualizations of COVID-19-related distress tend to be narrow and unidimensional, focusing largely on fear of infection (e.g., Ahorsu et al., 2020; Mertens et al., 2020). Our previous research on the COVID Stress Syndrome suggests a broader, more nuanced conceptualization (Taylor et al., 2020b, c). The present study is, to our knowledge, the first comprehensive network analysis of COVID-19-related worry, avoidance, coping, and other COVID-19-related variables, conducted in order to determine how these diverse elements are interrelated.

Consistent with previous research, the present study found that worry about the dangerousness of COVID-19 was at the core of the

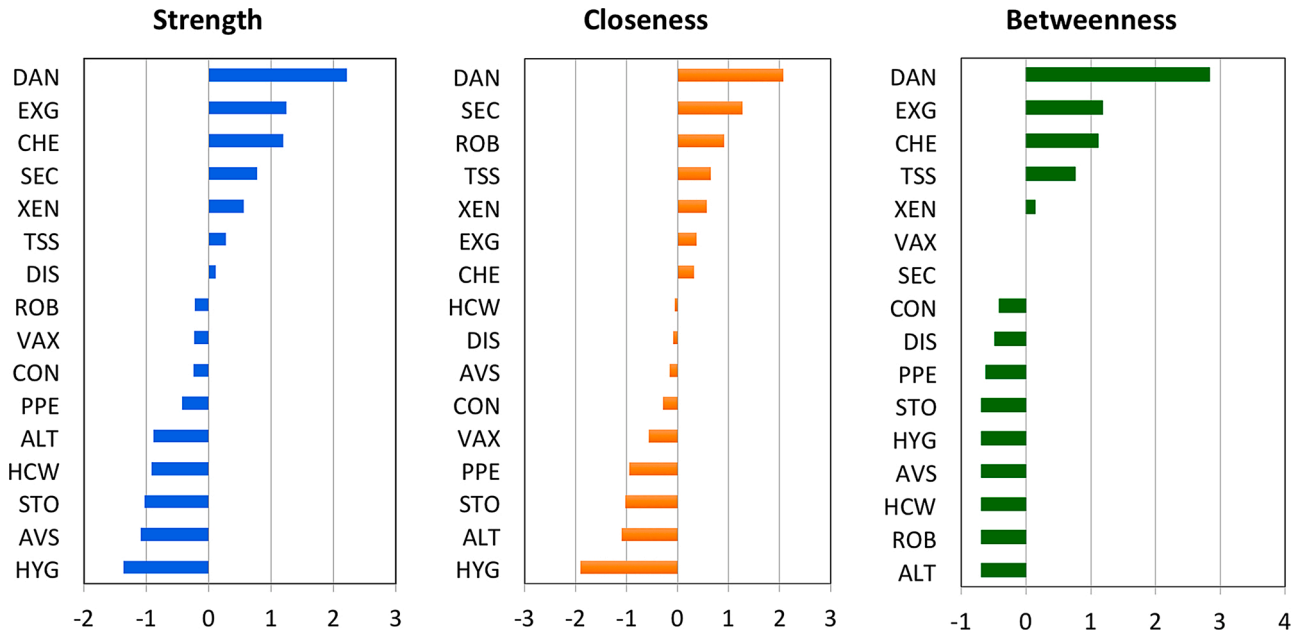


**Fig. 2.** Centrality indices for elements in the network analysis. Large values indicate that a given element had greater importance in the network, as indicated by its connections with other elements in the network.
Legend:
ALT: Pandemic-related altruism
AVS: COVID-19-related avoidance of supermarkets and drug stores
CHE: COVID-19-related compulsive checking and reassurance-seeking
CON: Belief in COVID-19-related conspiracy theories
DAN: Worry about the dangers of COVID-19 and worry about coming into contact with SARSCoV2-contaminated fomites
DIS: Disregard for social distancing
EXG: Belief that the threat of COVID-19 has been exaggerated
HCW: Fear and avoidance of healthcare workers
HYG: Practice of hand and cough hygiene
PPE: Use of personal protective equipment
ROB: Belief that one has robust physical health against COVID-19
SEC: Worry about the personal socio-economic impact of COVID-19
STO: Stockpiling and panic buying
TSS: COVID-19-related traumatic stress symptoms
VAX: Anti-vaccination attitudes toward a SARSCoV2 vaccine
XEN: Xenophobic worries that foreigners are spreading COVID-19.

COVID Stress Syndrome. This worry was at the core of the main hub in the network and was connected to various forms of fear, worry, avoidance, and other symptoms. The second most important hub, which was negatively correlated with the first hub, centered around the belief that the COVID-19 threat is exaggerated, and was associated with disregard for social distancing, poor hand hygiene, and anti-vaccination attitudes. The third most important hub, which was linked to the first hub, centered around COVID-19-related compulsive checking and reassurance-seeking. This hub was linked to self-protective behaviors, such as panic buying and use of personal protective equipment. COVID-19-related reexperiencing symptoms (e.g., intrusive thoughts or images, nightmares related to COVID-19) were also strongly linked to COVID-19-related checking and reassurance-seeking. This finding may reflect a dose effect whereby a greater degree of exposure to COVID-19-related news or social media (via checking) leads to a greater frequency of unwanted, intrusive thoughts, images, or nightmares about COVID-19.

The major hubs that were identified in the current study appear to be key factors to understanding the constellation of maladaptive and socially disruptive responses to COVID-19. As such, understanding the causal role of these major hubs as well as predictors (e.g., psychological vulnerability factors) or contextual (e.g., media messages) factors that contribute to the major hubs may be important avenues of future investigation. This line of research may have further implications as it may help identify potentially key targets for interventions (e.g., treatments, campaigns) aimed at reducing maladaptive or socially disruptive responses to COVID-19. For example, campaigns targeting the danger factor may be particularly relevant to address stigma towards foreigners and health care workers (2020d, Taylor et al., 2020c) whereas those targeting the belief that the COVID-19 threat is exaggerated may be germane for campaigns addressing compliance with behavioral strategies designed to reduce viral spread.

The findings of the present study are consistent with previous theory and research concerning health anxiety in general (Taylor & Asmundson, 2004, 2016). For example, as with pre-COVID-19 studies of health anxiety, we found that worries about COVID-19 were related to disease avoidance, safety behaviors (e.g., wearing personal protective equipment), and compulsive checking and reassurance-seeking. In this regard, COVID-19-related anxiety is similar to health anxiety in general. Our finding that worry about COVID-19 is associated with xenophobia is also consistent with previous research showing that xenophobia is correlated with the perceived vulnerability to disease (Taylor, 2019). Our research further shows that COVID-19-related worry is associated with additional phenomena that have not been previously linked to health anxiety, such as worry about the socioeconomic impacts of COVID-19. Previous research on health anxiety (prior to COVID-19) has focused almost entirely on feared consequences such as suffering, physical impairment, and dying. The present study suggests that research on health anxiety should take a broader perspective by considering whether worry about

the socioeconomic impacts of illness also plays an important, and possibly under-recognized, role in a person's overall level of health anxiety.

This study has various strengths and limitations. In terms of strengths, the sample was large and population representative. The study was, to our knowledge, the first to use network analysis to investigate how the various forms of worry, fear, avoidance, self-protective behaviors, and other COVID-19-related variables are inter-related. With few exceptions, the links were consistent with cognitive-behavioral formulations of health anxiety, traumatic stress symptoms, and pandemic-related behaviors (2019, Taylor & Asmundson, 2004; Taylor, 2017).

In terms of network replicability (generalizability), the present study provided preliminary evidence of replicability, but further research is needed using samples that are matched in size, so that the statistical power to detect significant edges is matched across samples. Statistical methods for comparing networks remain to be fully developed (Epskamp & Fried, 2018). Replicability can be assessed in terms of centrality values, patterns of significant edges, and magnitudes of edge values. In future research, networks can be compared across demographic variables (e.g., ethnicity, gender, age) as well as particular socio-cultural variables (e.g., political affiliation such as liberal versus conservative pollical views). Further research is also needed to determine whether the network structure changes as a function of whether particular health mandates are implemented (e.g., mandated wearing of face masks in public).

In terms of limitations, network analysis, as a statistical modeling method, is insufficient for determining the causal nature of the links between nodes. From a cognitive-behavioral perspective, it is plausible that worry about the danger of COVID-19 plays a causal role in promoting fear and avoidance of people, situations, or other stimuli associated with COVID-19. If this is the case, then cognitive-behavioral (or other) interventions targeting the core of the first hub (i.e., worry about the dangerousness of COVID-19) should influence other elements in the network, such as the various forms of fear and avoidance. This remains to be investigated in future research.

Another limitation of this study is that there are other potentially important variables that were not assessed. Our network analysis was the most comprehensive to date. To our knowledge, the only other COVID-19-related network analysis was in our previous study, which focused only on the five elements of the COVID Stress Syndrome. Other potentially relevant variables could be investigated in future network analyses. For example, future studies could be conducted to determine how drug and alcohol abuse is related to the elements in the network. The consumption of disinhibitory substances such as alcohol may be linked to elements of the COVID Stress Syndrome as well as the disregard for social distancing (McKay & Asmundson, 2020b,2020b). Further studies using network analysis are needed to investigate this possibility.

An important issue for further investigation concerns the temporal stability of the network. Pandemics are dynamic events, unfolding over time (Taylor, 2017), whereas our study was cross-sectional in nature. Pandemics and emotional responses to them may also unfold along different lines in different countries and even within a given country (Fitzpatrick, Drawve, & Harris, 2020). Accordingly, further research is needed to investigate whether the network changes over time and whether the network changes with the rise and fall of COVID-19 in and across communities. Understanding whether and to what extent distress-related and other emotional responses to viral outbreaks are dynamic in nature is critical for the development and delivery of interventions that are appropriately responsive to the needs of those these services are intended for.

## Ethical statement

The research described in this article was approved by the Research Ethics Board of the University of Regina (REB# 2020-043).

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## Data availability

Data available on request from the authors.

## Declaration of Competing Interest

The authors report no declarations of interest.

## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.janxdis.2020.102327.

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