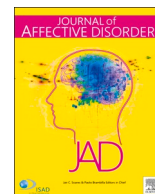




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Research paper

Modelling the contribution of the Big Five personality traits, health anxiety, and COVID-19 psychological distress to generalised anxiety and depressive symptoms during the COVID-19 pandemic

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ABSTRACT

In the current study we sought to extend our understanding of vulnerability and protective factors (the Big Five personality traits, health anxiety, and COVID-19 psychological distress) in predicting generalised anxiety and depressive symptoms during the COVID-19 pandemic. Participants ($n = 502$), who were United States residents, completed a variety of sociodemographic questions and the following questionnaires: Big Five Inventory-10 (BFI-10), Whitley Index 7 (WI-7), Coronavirus Anxiety Scale (CAS), COVID-19 Anxiety Syndrome Scale (C19-ASS), and Patient Health Questionnaire Anxiety and Depression Scale (PHQ-ADS). Results showed that extraversion, agreeableness, conscientiousness, and openness were negatively correlated with generalised anxiety and depressive symptoms and that neuroticism, health anxiety and both measures of COVID-19 psychological distress were positively correlated with generalised anxiety and depressive symptoms. We used path analysis to determine the pattern of relationships specified by the theoretical model we proposed. Results showed that health anxiety, COVID-19 anxiety, and the COVID-19 anxiety syndrome partially mediated the relationship between the Big Five personality traits and generalised anxiety and depressive symptoms. Specifically, extraversion, agreeableness, and conscientiousness were negatively associated with the three mediators, which, in turn, were positively associated with generalised anxiety and depressive symptoms, with COVID-19 anxiety showing the strongest effect. Conversely, neuroticism and openness were positively associated with COVID-19 anxiety and the COVID-19 anxiety syndrome, respectively. These relationships were independent of age, gender, employment status and risk status. The model accounted for a substantial variance of generalised anxiety and depression symptoms ($R^2 = .75$). The implications of these findings are discussed.

1. Introduction

It has now been over six months since the Coronavirus (COVID-19) was first identified in mainland China at the end of 2019 (World Health Organization, 2020). During this period, our lives have changed profoundly. A key change brought by the pandemic has been a surge of pandemic-related psychological distress including fear (Ahorsu et al., 2020), anxiety (Lee, 2020; Lee et al., 2020b), perceived threat (Conway, Woodard, & Zubrod, 2020), stress (Taylor et al., 2020), and an anxiety syndrome characterised by avoidance, checking, worrying and threat monitoring (Nikčević & Spada, 2020). Early findings from China have suggested that more than one quarter of the general population have experienced moderate to severe levels of stress- or anxiety-related symptoms in response to COVID-19 (Qiu et al., 2020;

Wang et al., 2020). These findings align themselves to those reported during the SARS outbreak (Cheng et al., 2004) and in the 2009 H1N1 pandemic (Rubin et al., 2009; Wheaton et al., 2012). We also know that those suffering from pandemic-related psychological distress tend to exhibit elevated levels of post-traumatic stress, general stress, anxiety, health anxiety, and suicidality (Chong et al., 2004; Wheaton et al., 2012; Wu et al., 2009; Yip et al., 2010) which may last well beyond the course of the pandemic.

At this stage of the current pandemic (end of June 2020) we therefore think it important to understand the relative contribution of COVID-19 psychological distress (anxiety and anxiety syndrome) to generalised anxiety and depressive symptoms controlling for what we see as key vulnerability factors and a wide array of sociodemographic variables. In line with Taylor's (2019) pandemic psychology

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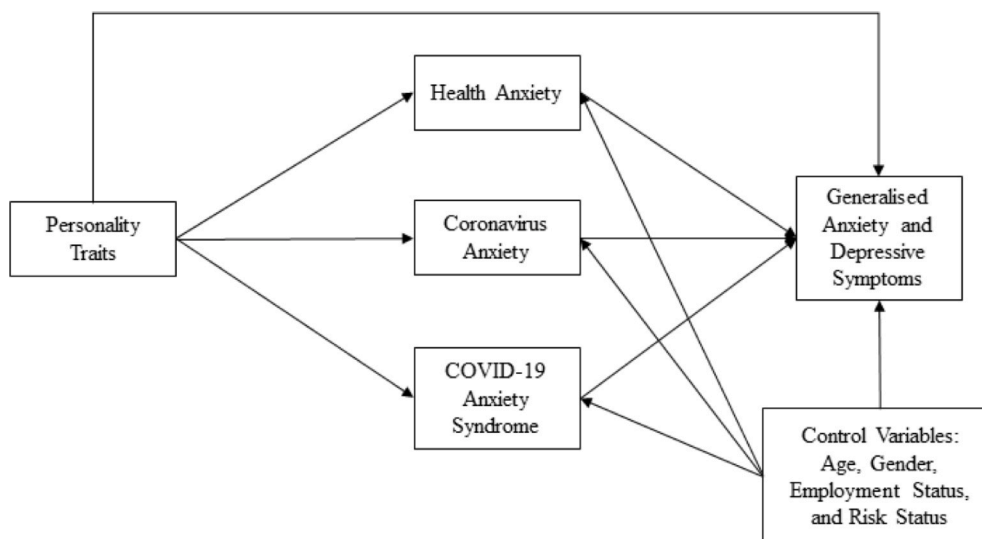


Figure 1. Proposed theoretical model.

perspective, which identifies key vulnerability factors to pandemic-related negative affect, we chose the Big Five personality traits to determine if neuroticism would be confirmed as a vulnerability factor and the remaining Big Five personality traits as possible protective factors. Furthermore, we also included health anxiety as a possible vulnerability factor because research has consistently demonstrated that individuals who score high on this construct tend to react to pandemic stress and health-related problems with intense negative affect (Taylor, 2019).

Figure 1 presents the model we aimed to test, through path analysis, where the Big Five personality traits predict health anxiety, COVID-19 anxiety, and the COVID-19 anxiety syndrome which in turn predict generalised anxiety and depressive symptoms. We also postulated that the Big Five personality traits (neuroticism as a vulnerability factor and the remaining traits as protective factors) may predict, directly, generalised anxiety and depressive symptoms. What follows is a brief review of the literature underpinning the delineation of the presented model.

2. The Big Five Personality Traits as Predictors of Negative Affect, Health Anxiety, and COVID-19 Psychological Distress

The Big Five model of personality traits has been studied extensively with respect to negative affect (Strickhouser, Zell, & Krizan, 2017). It is purported that the Big Five personality traits can account for about a third of the variance in measures of depression (Quilty et al., 2013), with the largest contributions coming from neuroticism (a vulnerability factor), extraversion and conscientiousness (the latter two protective factors) (Kotov et al., 2010; Strickhouser, Zell, & Krizan, 2017). Although the mechanisms underlying these relationships are not entirely clear, evidence suggests that dispositional coping styles (such as the expression of negative feelings), avoidance and support seeking might partially mediate the relationship between personality traits and mental health (Panayiotou, Kokkinos, & Kapsou, 2014).

In a very recent study undertaken at the height of the pandemic (April 2020) Lee and colleagues (2020a) showed that neuroticism predicted both generalised anxiety and depressive symptoms controlling for a wide array of sociodemographic variables (e.g. age, gender, etc.), COVID-19 factors (e.g. infected status), and vulnerability factors for experiencing psychological distress during a pandemic (health anxiety and reassurance-seeking behaviours). Similar findings (not assessing the Big Five personality traits) have also been observed in Italian samples (Mazza et al., 2020). The Big Five personality traits have also been found to predict work and social adjustment difficulties during the pandemic with neuroticism emerging as a vulnerability

factor and agreeableness as a protective factor (Nikčević & Spada, 2020).

With respect to the Big Five taxonomy, health anxiety appears to be most strongly correlated with neuroticism and conscientiousness (Cox, Borger, Asmundson, & Taylor, 2000; Ferguson, 2004). Noyes and colleagues (2005) also reported a strong correlation between health anxiety and negative temperament (which is similar to the Big Five's personality trait of neuroticism). In the afore mentioned study by Lee and colleagues (2020a), undertaken in the early phases of the pandemic, neuroticism was also found to be correlated with health anxiety. This study also indicated a positive correlation between neuroticism and COVID-19 anxiety. This finding was replicated and extended by Nikčević and Spada (2020) who observed that neuroticism is indeed a vulnerability factor for COVID-19 anxiety, but that, additionally, the remaining Big Five personality traits are protective factors (so inversely correlated with COVID-19 anxiety). Nikčević and Spada also observed that neuroticism is a vulnerability factor for the COVID-19 anxiety syndrome and extraversion and conscientiousness are protective factors.

3. Health Anxiety as a Predictor of Negative Affect

A wide research base has shown that catastrophic thinking about bodily symptoms and overestimation of the risk of serious illness (health anxiety) is linked to negative affective states ranging from mild to very severe presentations (Barsky, 1992; Greeven et al., 2006; Hiller et al., 2005; Longley et al., 2010). Patterns of co-morbidity have also shown that health anxiety is closely related to higher prevalence of other anxiety, mood, or somatoform diagnoses. Indeed, results of studies reporting on psychiatric co-morbidity in health anxiety have found, for example, prevalence of co-morbid Major Depressive Disorder ranges from 15% to 72%, and co-morbid Generalized Anxiety Disorder from 0% to 71% (Scarella et al., 2016).

4. COVID-19 Psychological Distress as Predictor of Negative Affect

In the present study we selected two measures of COVID-19 psychological distress: (1) the Coronavirus Anxiety Scale (CAS; Lee, 2020; Lee et al., 2020) which measures physiological anxiety related to COVID-19-related intrusive thoughts; and (2) the COVID-19 Anxiety Syndrome Scale (C-19ASS; Nikčević & Spada, 2020) which measures a cluster of cognitive-behavioural anxiety syndrome features characterised by avoidance, checking, worrying and threat monitoring. Evidence has already suggested that COVID-19 anxiety is a predictor of

negative affect (e.g. Lee, 2020; Lee et al. 2020a, 2020b). We have no evidence, as of yet, that the COVID-19 anxiety syndrome is directly linked to negative affect and, if so, that it is a predictor of negative affect independently of COVID-19 anxiety.

5. Aim of the Current Study

The aim of the current study is to extend our understanding of key vulnerability and protective factors in predicting generalised anxiety and depressive symptoms during the COVID-19 pandemic. With these aims in mind we propose to test a model where the Big Five personality traits predict health anxiety and COVID-19 psychological distress which in turn predict generalised anxiety and depressive symptoms (see Figure 1). We also controlled for a series of sociodemographic variables including age, gender, employment status, and risk status. We believed that considering these variables together may allow for a more comprehensive understanding of how personality traits and psychological vulnerability factors may exert influence, over and above socio-demographic variables and risk status, on generalised anxiety and depressive symptoms during the pandemic. We hypothesised that: (1) neuroticism would be positively correlated with health anxiety and COVID-19 psychological distress; (2) extraversion, agreeableness, conscientiousness and openness would be negatively correlated with health anxiety and COVID-19 psychological distress; and (3) health anxiety and COVID-19 psychological distress would be positively correlated with generalised anxiety and depressive symptoms.

6. Method

6.1. Participants

A convenience sample of 502 participants (234 females; mean age = 39.3 years [SD = 11.8; range 20 to 77 years]) was recruited for this study and completed a battery of questionnaires during mid-June 2020. Participants were required to: (1) be at least 18 years of age; (2) reside in the United States (see Procedure sub-section below); and (3) consent to participate. Eligibility criteria were minimal to attract a sample that represented a broad range of individuals. The ethnic background of this sample was as follows: 80.5% White, 8.0% Black, 4.2% Hispanic, 3.2% Asian, 2.6%, Mixed Race, and 1.6% Other. The majority of the sample was educated at college level (81.9%), married, co-habiting or in a civil partnership (72.1%), and employed (88.2%). Approximately one third of the sample (27.3%) had been tested for COVID-19 and considered themselves to be at 'high-risk' from the disease (29.9%), with 4.2% having experienced a loss as a consequence of COVID-19. Of those who considered themselves to be at high-risk, 46.2% stated this was due to a health problem, 37.9% because of older age, 7.6% because of being pregnant, 2.1% because of disability, 2.1% for other reasons, and 4.1% decided not to disclose the reason.

6.2. Measures

Sociodemographic Variables and Risk Status. Participants were asked to state their age, gender, ethnicity, and employment status (employed or not). They were also asked whether they considered themselves to be at 'high-risk' health-wise should they contract COVID-19 and to provide a reason for stating from the following categories: current health problem, older age, pregnancy, disability, and other reasons.

Big Five Inventory-10 (BFI-10; Rammstedt & John, 2007). This self-report measure includes 10 items, loading on five factors, assessing the Big Five domains of personality: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. Participants are asked to rate how well statements describe one's personality. The measure is scored using a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree) and scores range between 2-10 for each of the five

factors. Higher scores indicate higher levels of a given personality trait. The BFI-10 has demonstrated good reliability and validity across many sample groups (Rammstedt & John, 2007). No Cronbach α was calculated in view of the brevity of this measure and the presence of only two items per factor (e.g. Soto & John, 2017).

Whiteley Index 7 (WI-7; Fink et al., 1999). This self-report measure includes seven items, loading on a single factor, assessing health anxiety (e.g., "Do you think there is something seriously wrong with your body?"). Participants are asked to rate to what degree each statement applies to them. The original response format (yes or no) was adapted using a 5-point Likert scale (1 = Not at all to 5 = A great deal), as recommended by Welch, Carleton and Asmundson (2009), and scores range between 7-35. Higher scores indicate higher levels of a health anxiety. The WI-7 has demonstrated good reliability and validity across many sample groups (Fink et al., 1999; Welch, Carleton, & Asmundson, 2009). In the current study the Cronbach α = .90.

Coronavirus Anxiety Scale (CAS; Lee, 2020). This self-report measure includes five items, loading on a single factor, assessing physiologically based symptoms that are aroused with COVID-19 related information and thoughts (e.g., "I felt dizzy, lightheaded, or faint, when I read or listened to news about the Coronavirus"). Participants are asked to rate how frequently they experience each anxiety symptom. The measure is scored using a 5-point time anchored scale (0 = Not at all to 4 = Nearly every day over the last 2 weeks) and scores range between 0-20. Higher scores indicate higher levels of a COVID-19 anxiety. The CAS has demonstrated good reliability and validity in a recent validation study (Lee et al., 2020). In the current study the Cronbach α = .95.

COVID-19 Anxiety Syndrome Scale (C-19ASS; Nikčević & Spada, 2020). This self-report measure includes 9 items, loading on two factors, assessing features of the anxiety syndrome linked to COVID-19 including: (1) avoidance (e.g., of public transport because of the fear of contracting COVID-19); (2) checking (e.g., of symptoms of COVID-19); (3) worrying (e.g., researching symptoms of COVID-19 at the cost of other activities); and (4) threat monitoring (e.g., paying close attention to others displaying possible symptoms of COVID-19). Items relating to checking, worrying and threat monitoring load on the first factor ('perseveration') with the second factor consisting of avoidance items ('avoidance'). Participants are asked to rate how frequently they experience each feature of the anxiety syndrome. The measure is scored using a 5-point time anchored scale (0 = Not at all to 4 = Nearly every day over the last 2 weeks) and scores range between 0-36. Higher scores indicate higher levels of the presence of the anxiety syndrome. The C-19ASS has demonstrated good reliability and validity in two recent validation studies (Nikčević & Spada, 2020). The C-19ASS was found to predict COVID-19 anxiety over and above high-risk status, personality traits, and perceived COVID-19 threat, and work and social adjustment (functional impairment) over and above age, high-risk status, personality traits, and COVID-19 perceived threat and anxiety. In the current study the Cronbach α = .85.

Patient Health Questionnaire Anxiety and Depression Scale (PHQ-ADS; Kroenke et al., 2016). This self-report measure assesses the severity of generalised anxiety and depression symptoms. The PHQ-ADS combines the Generalized Anxiety Disorder 7-item (GAD-7; Spitzer et al., 2006) and the PHQ-9 (Kroenke Spitzer & Williams, 2001) self-report measures. The combined PHQ-ADS is a reliable and valid composite measure with good psychometric properties (Kroenke et al., 2016). Higher scores indicate higher symptoms of anxiety and depression. In the current study the Cronbach α = .95.

6.3. Procedure

Participants were recruited using Amazon's Mechanical Turk (MTurk), an internet-based platform that allows individuals to request the completion of jobs (e.g., survey completion) for monetary compensation. Respondents completing surveys through MTurk have been

found to produce high quality data and tend to be more demographically diverse than either standard internet samples or undergraduate samples (see Chandler & Shapiro, 2016, for a review). The present research was approved by Ethics Committee of Kingston University, London, United Kingdom. Recruitment was limited to MTurk workers over 18 years of age and located in the United States. We followed Paolacci and Chandler's (2014) recommendation and sought to improve data quality by restricting MTurk worker approval ratings, as research has found that “catch” questions do not improve data quality above and beyond recruiting MTurk workers with approval ratings above 95% (Peer, Vosgerau, & Acquisti, 2014). Worker specifications in the present study included restricting participation to MTurk workers who had approval ratings above 95%. Participants were required to provide electronic consent and there was no penalty for withdrawing from the study. Upon completion of the study, participants were debriefed and paid in full. Compensation was US\$1, an amount consistent with the compensation given to MTurk workers completing prior studies of similar length (Buhrmester, Kwang, & Gosling, 2011).

6.4. Data Analyses

An inspection of skewness and kurtosis values (Table 1) suggested that all measurements were overall normally distributed (being included in the conventional cut off of ± 3 [e.g., Mayers, 2013]). As a result, a series of Pearson Product-Moment correlation analyses were conducted on the data. The pattern of relationships specified by our hypothesised model (Figure 1) was tested through path analysis, using the Lavaan package (Rosseel, 2012) of the software R (R Development Core Team 2013). Specifically, a single observed score for each variable and the maximum likelihood methods (Satorra & Bentler, 1994) were used. In our model, the Big Five personality traits were the independent variables; health anxiety, COVID-19 anxiety, and the COVID-19 anxiety syndrome were the mediators; and generalised anxiety and depression symptoms was the dependent variable (Figure 1). Age, gender, employment status, and risk status were included as covariates of the mediators and the dependent variable. The mediating role of health anxiety and COVID-19 psychological distress was evaluated using the Sobel tests for mediation (Baron & Kenny, 1986; Hayes, 2009). We first tested the full model and then we subsequently removed step-by-step path coefficients not significant at the 5% level in order to select the most plausible model. To evaluate the goodness of fit of the model we considered the explained variance of each endogenous variable (R²) and the total coefficient of determination (TCD; Bollen, 1989; Jöreskog & Sörbom, 1996), which is commonly considered a reliable fit index of models run as path analysis (that is SEM for observed variables). The TCD represents the joined effect of all predictor variables on all dependent variables, so that higher TCD scores indicate more variance explained.

Table 1
Means, standard deviations, ranges, and inter-correlations of study variables.

	X	SD	Range	Skewness (SE)	Kurtosis (SE)	2	3	4	5	6	7	8	9
1. BFI-10-Ext	5.4	1.9	2-10	.27(.11)	-.27(.22)	.23**	.24**	-.28**	.64**	-.37**	-.30**	-.15**	-.36**
2. BFI-10-Agr	6.9	1.8	2-10	-.21(.11)	-.34(.22)		.37**	-.26**	.25**	-.35**	-.28**	.02	-.38**
3. BFI-10-Con	7.5	1.8	3-10	-.01(.11)	-1.06(.22)			-.43**	.35**	-.58**	-.46**	-.09	-.55**
4. BFI-10-Neu	5.4	1.9	2-10	.03(.11)	-.44(.22)				-.25**	.43**	.20**	.08	.48**
5. BFI-10-Ope	6.9	1.8	2-10	.08(.11)	-.33(.22)					-.33**	-.24**	.03	-.29**
6. WI-7	18.1	7.6	7-35	-.05(.11)	-1.28(.22)						.52**	.26**	.74**
7. CAS	8.9	5.9	0-20	.44(.11)	-1.11(.22)							.38**	.73**
8. C-19ASS	20.0	8.2	0-36	-.32(.11)	-.36(.22)								.37**
9. PHQ-ADS	15.9	12.6	0-48	.28(.11)	-1.11(.22)								

n = 502; *p < .05; **p < .01.

Note: BFI-10-Ext = Big Five Inventory-10-Extraversion; BFI-10-Agr = Big Five Inventory-10-Agreeableness; BFI-10-Con = Big Five Inventory-10-Conscientiousness; BFI-10-Neu = Big Five Inventory-10-Neuroticism; BFI-10-Ope = Big Five Inventory-10-Openness; WI-7 = Whitley Inventory 7; CAS = Coronavirus Anxiety Scale; C-19ASS = COVID-19 Anxiety Syndrome Scale; PHQ-ADS = Patient Health Questionnaire Anxiety and Depression Scale.

7. Results

7.1. Correlation Analyses

Table 1 shows the means, standard deviations, ranges, skewness, kurtosis, and inter-correlations for all the study variables. These revealed that all Big Five personality traits (with the exception of neuroticism) were negatively correlated with health anxiety, COVID-19 anxiety, and generalised anxiety and depression symptoms. Neuroticism was positively correlated with health anxiety, COVID-19 anxiety, and generalised anxiety and depression symptoms. Extraversion was negatively correlated with the COVID-19 anxiety syndrome. Health anxiety, COVID-19 anxiety and the COVID-19 anxiety syndrome were positively correlated to each other. These measures all also positively correlated with generalised anxiety and depression symptoms.

7.2. Path Analyses

A first version of the model was tested including all the variables of interest. However, several path coefficients were not significant at the p < .05 level and were removed step by step (i.e. the paths between health anxiety and openness, age, gender, and employment status; the paths between COVID-19 anxiety and openness, neuroticism and gender; the paths between the COVID-19 anxiety syndrome and agreeableness, conscientiousness, neuroticism, age, and gender; the paths between generalised anxiety and depression symptoms and extraversion, conscientiousness, openness, and sociodemographic variables (i.e. gender, risk status, and employment status) with the exception of age.

Therefore, the final model included all the significant paths and is depicted in Figure 2. In this model, three personality traits (i.e. extraversion, agreeableness, and conscientiousness) were negatively associated with health anxiety and COVID-19 anxiety. With regards to the COVID-19 anxiety syndrome, this was negatively associated with extraversion and positively associated with openness. Neuroticism was positively associated with one mediator (health anxiety), and directly linked to generalised anxiety and depression symptoms. Agreeableness was negatively and directly associated with generalised anxiety and depression symptoms, though weakly. The three mediators (i.e. health anxiety, COVID-19 anxiety, and the COVID-19 anxiety syndrome) were positively associated with generalised anxiety and depression symptoms, with COVID-19 anxiety showing the strongest association. Regarding the control variables, risk status was linked to all the three mediators, whereas employment status was linked to COVID-19 anxiety and the COVID-19 anxiety syndrome, and age to COVID-19 anxiety and generalised anxiety and depression symptoms.

Along with the direct paths, the Sobel test indicated the mediating role of health anxiety between four of the Big Five personality traits and generalised anxiety and depression symptoms: extraversion (β = -.479,

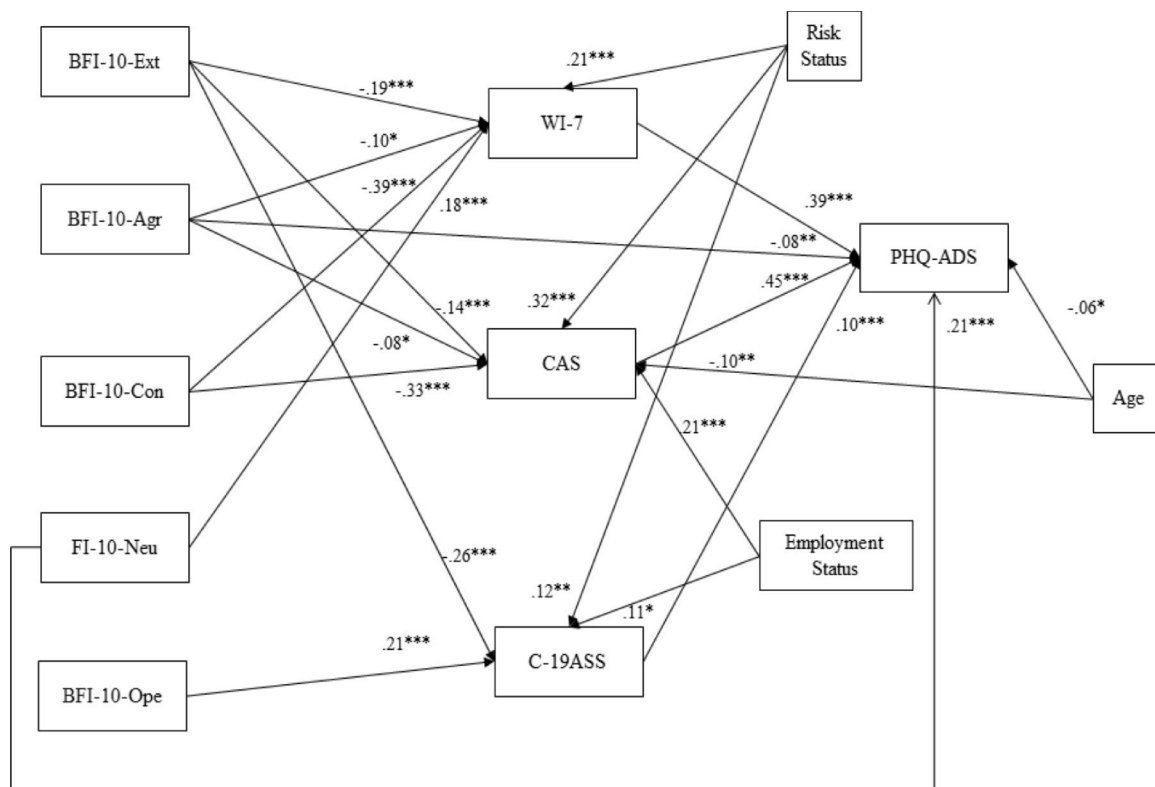


Figure 2. Results of the path analysis.

Notes: $n = 502$; $*p < .05$; $**p < .01$, $***p < .001$; BFI-10-Ext = Big Five Inventory-10-Extraversion; BFI-10-Agr = Big Five Inventory-10-Agreeableness; BFI-10-Com = Big Five Inventory-10-Conscientiousness; BFI-10-Neu = Big Five Inventory-10-Neuroticism; BFI-10-Ope = Big Five Inventory-10-Openness; WI-7 = Whitley Inventory 7; CAS = Coronavirus Anxiety Scale; C-19ASS = COVID-19 Anxiety Syndrome Scale; PHQ-ADS = Patient Health Questionnaire Anxiety and Depression Scale; Risk Status (0 = No, 1 = Yes); Employment Status (0 = No, 1 = Yes).

SE = .093, $z = -5.141$, $p < .001$), agreeableness ($\beta = -.240$, SE = .096, $z = -2.509$, $p = .012$), BFI-10-conscientiousness ($\beta = -1.050$, SE = .126, $z = -8.359$, $p < .001$), and neuroticism ($\beta = .441$, SE = .094, $z = 4.691$, $p < .001$). Moreover, COVID-19 anxiety mediated the relationship between three of the Big Five personality traits and generalised anxiety and depression symptoms as follows: extraversion ($\beta = -.414$, SE = .107, $z = -3.849$, $p < .001$), agreeableness ($\beta = -.232$, SE = .114, $z = -2.031$, $p = .042$), and conscientiousness ($\beta = -1.029$, SE = .130, $z = -7.913$, $p < .001$). Furthermore, the COVID-19 anxiety syndrome mediated the relationship between two of the Big Five personality traits and generalised anxiety and depression symptoms: extraversion ($\beta = -.162$, SE = .052, $z = -3.127$, $p = .002$), and openness ($\beta = .136$, SE = .048, $z = 2.816$, $p = .005$).

Regarding the model fit, the model accounted for 75% of the variance of generalised anxiety and depression symptoms, 47% for health anxiety, 41% for COVID-19 anxiety, and 7% for the COVID-19 anxiety syndrome. Finally, the total amount variance explained by the model (TCD = .72) indicated a very good fit to the observed data. In terms of effect size, TCD = .72 corresponds to a correlation of $r = .85$ (which is large effect size according to the Cohen's [Cohen, 1988] traditional criteria).

8. Discussion

The aims of the current study were to extend our understanding of vulnerability and protective factors to COVID-19 related and general psychological distress. We tested a model where we hypothesised that the Big Five personality traits would predict health anxiety and COVID-19 psychological distress, which in turn would predict generalised anxiety and depressive symptoms (see Figure 1). The path analysis of our hypothesised model and the amount of variance explained revealed that

it fits the data very well, thus suggesting that the proposed model is sustainable. Specifically, in the model, we observed that health anxiety and COVID-19 psychological distress (anxiety and the anxiety syndrome) played a mediating role in the relationship between the Big Five personality traits and generalised anxiety and depression symptoms, with COVID-19 anxiety and health anxiety showing stronger effects when compared to the COVID-19 anxiety syndrome. This finding is the first to show that generalised anxiety and depression symptoms assessed during the time of the pandemic are not only dictated by personality traits and the tendency towards being health anxious but also (and importantly and significantly) by COVID-19 psychological distress and relevant sociodemographic variables.

The positive association between health anxiety on the one hand and generalised anxiety and depression symptoms on the other is well established (e.g., Sunderland, Newby, & Andrews, 2013). Our study provides firm evidence for the suggested relationship between health anxiety and COVID-19 anxiety (Jungmann & Witthöft, 2020). Furthermore, our results shed light on the role of the Big Five personality traits in this relationship: three personality traits (i.e. extraversion, agreeableness, and conscientiousness) were negatively associated with health anxiety, which, in turn, was positively associated with generalised anxiety and depression symptoms. Moreover, extraversion was negatively associated with the COVID-19 anxiety syndrome, whilst openness was positively associated showing that the two traits are likely to have an opposite effect (protective vs. vulnerability inducing respectively). Neuroticism was positively associated with health anxiety, and directly associated with generalised anxiety and depression symptoms suggesting that emotional instability is central in the development of anxiety symptoms (Jylhä & Isometsä, 2006). Agreeableness was negatively and directly associated with generalised anxiety and depression symptoms, though weakly.

These findings, taken together, confirm previous observations of neuroticism being a vulnerability factor for both health anxiety and generalised anxiety and depression symptoms (e.g., Jylhä & Isometsä, 2006; Williams, 2004), and conscientiousness being a protective factor for both health anxiety and COVID-19 anxiety (e.g., Ferguson, 2004; Nikčević & Spada, 2020). The findings also showcase the importance, not observed before in the literature, of the key protective role played by both agreeableness and extraversion in predicting COVID-19 psychological distress (anxiety and anxiety syndrome). It may be plausible to assume that during the period of isolation, these two personality traits may have contributed to the activation of coping mechanisms (e.g. connecting with others, showing community spirit, etc.) that will have mitigated negative affect. A further interesting finding relates to the positive link between openness and the COVID-19 anxiety syndrome. It is possible to argue that those who are excessively open to experiences (so more prone to taking 'socio-health' risks in the current period) will also be the ones more likely to ruminate and threat monitor about having done so.

The data also shows that being employed in this period is associated with higher levels of COVID-19 psychological distress, both in terms of the reported COVID-19 anxiety as well as the COVID-19 anxiety syndrome. A possible explanation for this association is that a proportion of those employed are likely to continue to physically go to work increasing the perceived threat of being infected by COVID-19. Furthermore, even for those who can continue working from home, the pandemic has presented a major threat to the employment community. The possibility of losing one's job or experiencing adverse financial consequences due to the pandemic has been a constant source of insecurity and threat for the employed community and is likely to have translated into COVID-19-related psychological distress. This may well have manifested (or has begun manifesting) in physical symptoms of anxiety as well as in elevated COVID-19 anxiety syndrome features such as worry, checking, monitoring and avoidance. Our data also suggests that the perception of being at high-risk (be it due to the presence of a chronic illness, being pregnant, of older age, or suffering from disability) is also associated with higher levels of health anxiety, as well as with COVID-19 psychological distress. Objectively, a high-risk status will inevitably bring a greater perception of threat from infection and, as our findings show, a greater COVID-19 anxiety syndrome response. Whilst there may be little that 'at risk' populations may do to minimise that threat, apart from observing the recommended guidelines, some efforts could be directed at minimising the COVID-19-related threat via the pathway of the COVID-19 anxiety syndrome. This would mean assisting people in reducing the time spent checking for COVID-19 information and threats as well as monitoring for signs of infections and worrying about the possibility of becoming infected. In some instances, it may be also important to reduce excessive avoidance and facilitate gradual re-engagement and return to 'normal' functioning.

Our findings also highlight that being younger (that is, in one's thirties in our sample) is associated with higher levels of COVID-19 anxiety and generalised anxiety and depression symptoms. This finding, at this stage, is difficult to explain. Certainly, as COVID-19 infections are more virulent in older people and associated with greater degree of morbidity and mortality in this group, one would expect that they would result in higher levels of COVID-19 psychological distress amongst older people. Further research should examine the nature of the observed anxiety in the younger adult population and suggest suitable interventions.

9. Limitations

There are several limitations that should be considered in the interpretation of these conclusions. First, data was solely based on self-report questionnaires, which may be subject to social desirability, self-report errors and poor recall. We had no means of assessing objective high-risk status such as the existence of health problems in our sample

Second, this study used a cross sectional design, which does not allow for causal inferences. It remains unknown at present whether features of the COVID-19 psychological distress are causal to generalised anxiety and depression symptoms or epiphenomenal. Third, the participants in this study may not have been representative of the general population as they were all based in the United States. The sample was homogenous, and overwhelmingly Caucasian. Due to the small number of ethnicities of non-Caucasian background, we were not able to conduct analyses to examine the impact of ethnic background in the proposed model. This limitation could be addressed in future studies by ensuring a more diverse sample of participants. Furthermore, we employed convenience sampling. However, systematic research on MTurk has demonstrated that MTurk participants are at least as diverse as typical internet and traditional methods, and the data derived from this source are of high quality (Buhrmester et al., 2011). A larger sample size might have been able to correct for this.

10. Conclusions

Despite these above limitations, we believe that the current study extends our understanding of key vulnerability and protective factors (the Big Five personality traits, health anxiety, and COVID-19 psychological distress) in predicting generalised anxiety and depressive symptoms during the COVID-19 pandemic.

Declaration of Competing Interest

None.

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