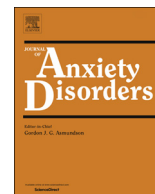




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Incremental validity of coronaphobia: Coronavirus anxiety explains depression, generalized anxiety, and death anxiety



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ABSTRACT

The adverse psychological effects of COVID-19 have increased globally. Moreover, the psychological toll may be worsening for this health crisis due to the growing numbers of mass deaths and unemployment levels. Coronaphobia, a relatively new pandemic-related construct, has been shown to be strongly related to functional impairment and psychological distress. However, the extent to which coronaphobia is uniquely accountable for the psychological distress experienced during the COVID-19 crisis has not been systematically investigated. The current study examined this question of incremental validity using online data from 453 adult MTurk workers in the U.S. The results of a series of hierarchical multiple regression analyses demonstrated that coronaphobia explained additional variance in depression, generalized anxiety, and death anxiety, above sociodemographics, COVID-19 factors, and the vulnerability factors of neuroticism, health anxiety, and reassurance-seeking behaviors. These findings suggest that health professionals should be aware of coronaphobia as this expression of pandemic-related stress has reliably demonstrated incremental validity in accounting for major indicators of psychological distress.

1. Introduction

The adverse effects of the COVID-19 pandemic are becoming frighteningly evident across the globe. The psychological toll of this health crisis may be worsening as the number of deaths, mass unemployment, and quarantine measures continue to rise at alarming rates. Although empirical research into this fear and anxiety about COVID-19 or “coronaphobia,” as [Asmundson and Taylor \(2020\)](#) coined it, is still in the early phases of development, some data suggest that it is playing a prominent role in people’s psychological well-being. For instance, many Americans are using prescription drugs to cope with their stress and anxiety, as demand for anti-anxiety medications has increased 34.1 % from mid-February to mid-March in the year 2020 ([Digon, 2020](#)).

Research on coronaphobia has revealed that individuals who are fearful and anxious about COVID-19 tend to experience a coherent set of unpleasant, physiological symptoms that are triggered by thoughts or information associated with this infectious disease ([Evren, Evren, Dalbudak, Topcu, & Kutlu, 2020](#); [Lee, 2020](#)). Clinical levels of coronaphobia have been operationally defined by scores of nine or greater on the Coronavirus Anxiety Scale ([Lee, 2020](#); [Lee, Mathis, Jobe, & Pappalardo, 2020](#)). Coronaphobia has been shown to be strongly associated with elevated depression, generalized anxiety, hopelessness,

suicidal ideation, and functional impairments ([Lee, 2020](#); [Lee, Jobe, & Mathis, 2020](#); [Lee, Mathis et al., 2020](#)). More shockingly, alleged cases of suicide due to coronaphobia are also beginning to emerge ([Goyal, Chauhan, Chhikara, Gupta, & Singh, 2020](#); [Mamun & Griffiths, 2020](#)). Psychological distress emphasized through associations like generalized anxiety and depression may not be alone in their contributions to coronaphobia. The cases of suicide draw into question the role of death anxiety on being a potential contributor, as there is a relatively high mortality rate for COVID-19, especially when compared to historic epidemics, the seasonal flu, and to the leading causes of death in the U.S ([Begley & Empinado, 2020](#)). Thus, the emergence of possible death anxiety, depression, and generalized anxiety and their roles pertaining to coronaphobia should be better understood.

To date, the extent to which coronaphobia is uniquely responsible for the psychological distress that is being observed during this pandemic has not been systematically investigated. The answer to this incremental validity question is vital to health professionals and researchers trying to understand the risk factors for clinically significant distress during this disease outbreak ([Taylor, 2019](#)). Therefore, we sought to answer this question by following [Hunsley and Meyer’s \(2003\)](#) approach. Specifically, we used hierarchical multiple regression analyses to determine if coronaphobia could statistically predict major indicators of psychological distress beyond sociodemographics, COVID-

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19 factors, and three vulnerability factors to pandemic-related stress described in *The Psychology of Pandemics*, a recent book by Steven Taylor (2019).

We chose neuroticism (i.e., the tendency to experience negative emotions) and health anxiety (i.e., the tendency to worry about health and having a serious illness) among other vulnerability factors proposed by Taylor (e.g., perfectionism) because research has consistently demonstrated that individuals high in these traits tend to react to pandemic stress and health-related problems with intense emotional distress (Taylor, 2019). Because of the lethal, mysterious, and highly infectious reputation of COVID-19, we expected neuroticism and health anxiety to be positively correlated with emotional distress. We also chose reassurance-seeking behaviors (i.e., attempts to relieve anxiety by seeking reassurances that one has not been infected with the coronavirus) from Taylor's list of vulnerability factors because many symptoms of common illnesses (e.g., seasonal allergies), such as shortness of breath, can be easily misinterpreted as signs of COVID-19. Therefore, given the fears and high threat of infection regarding the coronavirus in the current pandemic, we expected reassurance-seeking behavior to also be positively correlated with emotional distress.

2. Method

2.1. Participants and procedures

The participants of this IRB approved investigation included 453 adult MTurk workers in the U.S. who completed an online survey on April 15th, 2020. The participants provided online consent and received payment (\$0.50) for their involvement in this study. The sample consisted of 215 women, 237 men, and 1 "other" gender with a median age of 33 years (range from 18 to > 65). Most of the participants were White (70.0 %), had earned at least a Bachelor's degree (72.0 %), had not tested positive for COVID-19 (89.6 %), and did not know someone with COVID-19 (68.7 %).

2.2. Measures

We asked participants to report their age, gender, ethnicity, and education level as measures of sociodemographic variables. We also asked the participants if they tested positive for COVID-19 and if they knew someone with COVID-19 as measures of the COVID-19 factors. To assess Taylor's (2019) vulnerability factors, we measured the personality trait of neuroticism ($M = 22.33$; $SD = 7.04$) using John and Srivastava's (1999) 8-item scale—where participants rated their agreement on a 1 (*disagree strongly*) to 5 (*agree strongly*) scale ($\alpha = .86$) to self-descriptive traits (e.g., "I see myself as someone who worries a lot."); health anxiety ($M = 34.95$; $SD = 9.28$) using Salkovskis, Rimes, Warwick, and Clark's (2002) 18-item inventory—where participants were asked to select a health-related statement that best described their feelings over the past six months (e.g., "I do not worry about my health.") ($\alpha = .92$); and reassurance-seeking behaviors ($M = 6.23$; $SD = 5.51$) using a 5-item scale we created for this study—where participants rated on a 0 (*not at all*) to 4 (*nearly every day over the last 2 weeks*) scale ($\alpha = .90$) how frequently they engaged in reassurance-seeking activities (see Table 1).

Coronaphobia ($M = 5.06$; $SD = 5.53$) was measured using Lee's (2020) 5-item scale—where participants rated on a 0 (*not at all*) to 4 (*nearly every day over the last 2 weeks*) scale ($\alpha = .93$) how frequently they experienced coronavirus anxiety (e.g., "I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus."). The outcome measures of psychological distress were assessed using Abdel-Khalek's (1998) single-item death anxiety scale ($M = 3.13$; $SD = 1.36$), where participants rated the extent to which they agreed on a 1 (*disagree strongly*) to 5 (*agree strongly*) scale to the statement, "I am afraid of death."; and Kroenke et al.'s (2009) 2-item scales of depression ($M = 2.31$; $SD = 1.93$; $\alpha = .82$) and generalized

anxiety ($M = 2.47$; $SD = 1.86$; $\alpha = .84$), whose items were rated from 1 (*not at all*) to 4 (*nearly every day*) on their frequency over the past two weeks (e.g., "Feeling nervous, anxious, or on edge.").

3. Results

3.1. Descriptive statistics and zero-order correlations

The descriptive statistics reveal that a significant number of the participants experienced clinically elevated levels of psychological distress. The rates of depression (PHQ-4 ≥ 3 ; Kroenke, Spitzer, Williams, & Löwe, 2009), anxiety (PHQ-4 ≥ 3 ; Kroenke et al., 2009), health anxiety (SHAI ≥ 45 ; Alberts, Hadjistavropoulos, Jones, & Sharpe, 2017), and coronaphobia (CAS ≥ 9 ; Lee, 2020), were 45.3 %, 47.0 %, 15.2 %, and 28.7 %, respectively. In addition, rates of death anxiety were 26.3 % for participants who "agree a little" and 18.8 % for participants who "agree strongly" to the item, "I am afraid of death" (Abdel-Khalek, 1998).

Zero-order correlations demonstrated that coronaphobia was significantly associated with all of the study variables. Specifically, coronaphobia was associated with age ($r = -0.11$), gender ($r = -0.17$), race ($r = -0.17$), education ($r = .22$), COVID-19 infection ($r = .33$), knowledge of someone with COVID-19 infection ($r = .21$), neuroticism ($r = .37$), health anxiety ($r = .50$), reassurance-seeking behaviors ($r = .81$), depression ($r = .66$), generalized anxiety ($r = .58$), and death anxiety ($r = .30$). Because the sociodemographic variables, COVID-19 factors, vulnerability factors, and outcome variables were also inter-correlated, the inclusion of these variables into the regression analyses were warranted.

3.2. Hierarchical multiple regression analyses

A preliminary screening of the data revealed that the assumptions for multiple regression analyses were met, as no issues were found with singularity, multicollinearity, dependence of errors, normality, linearity, or homoscedasticity of residuals (Tabachnick & Fidell, 2001). Three separate hierarchical multiple regression analyses were performed based on Hunsley and Meyer's (2003) incremental validity approach. The first step of the regression analyses included the sociodemographic variables of age, gender (1 = women; 0 = men and other), ethnicity (1 = White; 0 = non-White), and education (1 = Bachelor's degree and higher; 0 = less than a Bachelor's degree). The second step added the COVID-19 factors of personal diagnosis (1 = infected with coronavirus; 0 = not infected), and personal knowledge of someone with COVID-19 (1 = yes; 0 = no). The third step added Taylor's (2019) vulnerability factors for experiencing psychological distress during a pandemic, which are neuroticism, health anxiety, and reassurance-seeking behaviors. The final step included the measure of coronaphobia. The outcome variables, which reflect different domains of psychological distress, were depression, generalized anxiety, and death anxiety (see Table 2 for regression summary).

In the first regression analysis, depression was the outcome variable. In the first step, age ($\beta = -.15$, $p < .01$) emerged as the only sociodemographic variable that was a significant predictor in the model, $R^2 = .04$, $F(4, 448) = 4.91$, $p < .01$. In the second step, when the COVID-19 factors were included, COVID-19 infection ($\beta = .14$, $p < .01$) and age ($\beta = -.14$, $p < .01$) were both significant predictor variables, $R^2 = .07$, $F(6, 446) = 5.77$, $p < .001$. In the third step, when the vulnerability factors were included, neuroticism ($\beta = .46$, $p < .001$), health anxiety ($\beta = .16$, $p < .001$), and reassurance-seeking behaviors ($\beta = .32$, $p < .001$) were the only significant predictor variables in the model, $R^2 = .55$, $F(9, 443) = 59.33$, $p < .001$. In the final step, when coronaphobia was included, neuroticism ($\beta = .40$, $p < .001$), health anxiety ($\beta = .10$, $p < .01$), and coronaphobia ($\beta = .47$, $p < .001$), were the only significant predictor variables in the model, $R^2 = .61$, $F(10, 442) = 69.34$, $p < .001$. These

Table 1
Coronavirus Reassurance-Seeking Behaviors Scale.

Not at all	Rare, less than a day or two	Several days	More than 7 days	Nearly every day over the last 2 weeks
0	1	2	3	4
1.	I took my temperature to see if I was infected with the coronavirus disease.			
2.	I read information on the internet to see if I had symptoms of the coronavirus disease.			
3.	I read or watched videos to see if I was infected with the coronavirus disease.			
4.	I spoke with other people about my symptoms to see if I was infected with the coronavirus disease.			
5.	I spoke with a medical professional about my symptoms to see if I was infected with the coronavirus disease.			

Note. The *Coronavirus Reassurance-Seeking Behaviors Scale* is placed in the public domain to encourage its use in clinical assessment and research. No formal permission is therefore required for its reproduction and use by others, beyond appropriate citation of the present article.

Instructions: Please indicate how often you experienced each activity over the last 2 weeks.

Table 2
Hierarchical Multiple Regression Final Step Summary.

Predictors	Depression	Generalized Anxiety	Death Anxiety
Age	-.03	.03	-.01
Gender	-.05	.03	.00
Ethnicity	.03	.01	.01
Education	-.02	-.04	.03
Diagnosis	-.01	.00	.03
Knowledge	-.01	.07*	.00
Neuroticism	.40***	.47***	.22***
Health Anxiety	.10**	.08*	.20***
Reassurance-seeking	.00	-.08	-.06
Coronaphobia	.47***	.43***	.16*
<i>R</i> ²	.61	.58	.19
Change in <i>R</i> ²	.06	.06	.01
Significant <i>F</i> change	<i>p</i> < .001	<i>p</i> < .001	<i>p</i> < .05

Note. Above values reflect standardized regression coefficients. Changes in *R*² and *F* values reflect the addition of coronaphobia in the final steps of the models. Gender (1 = women; 0 = men and other), Ethnicity (1 = White; 0 = non-White), Education (1 = Bachelor's degree and higher; 0 = less than a Bachelor's degree), Diagnosis = COVID-19 diagnosis (1 = infected with COVID-19; 0 = not infected), Knowledge = personal knowledge of someone with COVID-19 (1 = yes; 0 = no).

* *p* < .05.

** *p* < .01.

*** *p* < .001.

results support the incremental validity of coronaphobia in explaining 6 % more variance in depression symptoms above sociodemographics, COVID-19 factors, and vulnerability factors.

In the second regression analysis, generalized anxiety was the outcome variable. In the first step, age ($\beta = -.10, p < .05$) emerged as the only sociodemographic variable that was a significant predictor. However, the entire model itself was not significant, $R^2 = .02, F(4, 448) = 1.76, p = .14, ns$. In the second step, when the COVID-19 factors were included, COVID-19 infection ($\beta = .13, p < .01$) and knowledge of someone with COVID-19 ($\beta = .14, p < .01$) were both significant predictor variables, while age dropped out of significance ($\beta = -.09, p = .06, ns$), $R^2 = .06, F(6, 446) = 4.74, p < .001$. In the third step, when the vulnerability factors were included, neuroticism ($\beta = .53, p < .001$), health anxiety ($\beta = .14, p < .01$), and reassurance-seeking behaviors ($\beta = .22, p < .001$) were the only significant predictor variables in the model, $R^2 = .52, F(9, 443) = 53.99, p < .001$. In the final step, when coronaphobia was included, knowledge of someone with COVID-19 ($\beta = .07, p < .05$), neuroticism ($\beta = .47, p < .001$), health anxiety ($\beta = .08, p < .05$), and coronaphobia ($\beta = .43, p < .001$), were the only significant predictor variables in the model, $R^2 = .58, F(10, 442) = 60.52, p < .001$. These results support

the incremental validity of coronaphobia in explaining 6% more variance in generalized anxiety symptoms above sociodemographics, COVID-19 factors, and vulnerability factors.

In the last regression analysis, death anxiety was the outcome variable. In the first step, none of the sociodemographic variables were significant predictors, $R^2 = .01, F(4, 448) = 1.46, p = .21, ns$. In the second step, when the COVID-19 factors were included, none of the variables were significant predictors, $R^2 = .02, F(6, 446) = 1.85, p = .09, ns$. In the third step, when the vulnerability factors were included, only neuroticism ($\beta = .24, p < .001$) and health anxiety ($\beta = .22, p < .001$) were significant predictor variables in the model, $R^2 = .18, F(9, 443) = 10.94, p < .001$. In the final step, when coronaphobia was included, neuroticism ($\beta = .22, p < .001$), health anxiety ($\beta = .20, p < .001$), and coronaphobia ($\beta = .16, p < .05$) were the only significant predictor variables in the model, $R^2 = .19, F(10, 442) = 10.31, p < .001$. These results modestly support the incremental validity of coronaphobia in explaining 1% more variance in death anxiety symptoms above sociodemographics, COVID-19 factors, and vulnerability factors.

4. Discussion

The purpose of this study was to examine the extent to which coronaphobia uniquely explains psychological distress experienced during the COVID-19 crisis using 453 adult MTurk workers in the U.S. The results of a series of hierarchical multiple regression analyses demonstrated that coronaphobia explained additional variance in depression, generalized anxiety, and death anxiety, above sociodemographics, COVID-19 factors, and the vulnerability factors of neuroticism, health anxiety, and reassurance-seeking behaviors. These findings suggest that health professionals and researchers should pay particular attention to coronaphobia as this expression of pandemic-related stress has reliably demonstrated incremental validity in accounting for major indicators of psychological distress.

The findings that health anxiety and neuroticism were also significant predictors of the models tested in this study supported Taylor's (2019) proposal that these vulnerability factors would negatively affect people's emotional well-being during a pandemic and the patterns were in accordance with previous research (Anagnostopoulos & Botse, 2016; Wheaton, Abramowitz, Berman, Fabricant, & Olatunji, 2012). Although reassurance-seeking behaviors, which is a hallmark feature of anxiety, was not a significant predictor variable in this study, it was strongly correlated with health anxiety ($r = .43, p < .001$) and coronaphobia ($r = .81, p < .001$). These associations are consistent with Taylor's (2019) hypothesis that people with excessive anxiety about an infectious disease are expected to repeatedly seek reassurances that they are not sick during a pandemic.

Given that neuroticism, health anxiety, and coronaphobia were unique predictors of psychological distress in this study, future research

may want to examine the effects of adapting internet-based cognitive behavior therapy (ICBT) protocols to help people suffering from exceptionally high levels of COVID-19-related anxiety and distress. According to a study conducted by Hedman et al. (2014), ICBT significantly reduced the effects of neuroticism-related personality traits in participants over a period of 12 weeks. The reduction of these traits was correlated with improvements in health anxiety. Hedman et al. (2014) also suggested that decreases in participant neuroticism were linked with decreases in the likelihood of engaging in potentially impairing safety behaviors, such as looking up symptoms on the Internet. Moreover, while quarantine and social distancing measures are in place, using a telehealth type of therapy may be the most practical of psychological services to address psychological conditions at this time.

The results of the current study must be qualified by a couple of limitations. First, this study was limited by its exclusive use of online survey methodology. Future research would benefit from incorporating structured clinical interviews and interviews with friends and family members of the participants in order to obtain a deeper and more comprehensive evaluation of the participants' psychological states of mind. Another limitation of this study was that it only focused on three general expressions of psychological distress as outcome measures. Future research would benefit from examining other global states of distress, such as perceived stress (Cohen, Kamarck, & Mermelstein, 1983), as well as specific forms of distress, such as COVID-19 traumatic stress (Taylor et al., 2020). Finally, given the cross-sectional and convenience sampling methods of this study, neither the causal ordering of the variables nor the extent to which sampling bias affected the results could be determined. Therefore, replication and extension of this research using larger, more representative samples with longitudinal designs are desirable in future work. Despite these limitations, the results of the current study support the incremental validity of the coronaphobia construct.

5. Conclusion

This study provides the first empirical evidence, using incremental validity analyses, that the coronaphobia construct coined by Asmundson and Taylor (2020) is a unique predictor of psychological distress during the COVID-19 crisis. These results further support the inclusion of instruments, such as the Coronavirus Anxiety Scale (Lee, 2020), to study the mental health and well-being of individuals psychologically affected by the COVID-19 pandemic. Future research should examine coronaphobia and its influence on psychological well-being over time, using large, representative samples with longitudinal designs.

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