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Increases in distress during stay-at-home mandates During the COVID-19 pandemic: A longitudinal study

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ABSTRACT

The Coronavirus disease 2019 (COVID-19) pandemic has contributed to over 500,000 deaths, and hospitalization of thousands of individuals worldwide. Cross-sectional data indicate that anxiety and depression levels are greater during the pandemic, yet no known prospective studies have tested this assertion. Further, individuals with elevated trait anxiety *prior* to a global pandemic may theoretically be more apt to experience greater pandemic-related anxiety and/or impairment. The current study tested whether anxiety and depression increased from the month before the state's Stay-At-Home order to the period of the Stay-At-Home order among 120 young adults in Louisiana, a state with especially high rates of COVID-19 related infections and deaths. We also tested whether pre-pandemic social anxiety was related to greater pandemic related anxiety, depression, and COVID-related worry and impairment. Depression but not anxiety increased during the Stay-At-Home order. Further, pre-pandemic trait anxiety, social anxiety, and depression were statistically significant predictors of anxiety and depression during the Stay-At-Home order, although only social anxiety was robustly related to COVID-related worry and impairment. Emotional distress increased during the COVID-19 pandemic Stay-At-Home order and this is especially the case among individuals with pre-pandemic elevations in trait anxiety (especially social anxiety) and depression.

1. Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has thus far contributed to over 500,000 deaths, and hospitalization of thousands of individuals worldwide (Pettersson et al., 2020). It has also been found to be related to cross-sectional reports of elevated levels of anxiety and distress (Rosen et al., 2020). Although it is normative to experience elevated anxiety and fear in the face on an on-going health threat such as COVID-19, individuals with certain underlying characteristics experienced greater distress and impairment in the face of other types of crises such as the 9/11 terror attack and Hurricane Katrina. For example, individuals with greater pre-9/11 analogue generalized anxiety disorder (GAD) experienced more post-traumatic stress symptoms following 9/11 (Farach et al., 2008) and greater trait anxiety was related to more post-Katrina post-traumatic stress, generalized anxiety, and depression even after accounting for hurricane-related factors, such as loss of home, death of a loved one, and relocation (Weems et al., 2007). Thus, it may be that individuals with elevated trait anxiety prior to a global pandemic may experience greater pandemic-related anxiety and/or impairment. However, we are not aware of any published prospective research examining COVID-related psychological functioning as a function of pre-pandemic anxiety or depression.

Social anxiety is one phenotypic expression of anxiety that has received little attention in terms of response to disasters such as 9/11 and Hurricane Katrina. Yet, social anxiety is an important individual difference variable to consider for several reasons, including that it is one of the most common anxiety conditions (Kessler et al., 2012) and social anxiety disorder is among the most common psychiatric disorders (Kessler et al., 2005). Further, given the impacts on social functioning inherent in Stay-At-Home and Shelter-In-Place orders associated with, socially anxious persons may be especially vulnerable to worse COVID-related emotional outcomes.

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The aims of this study were to further understanding of the emotional impact of the COVID-19 pandemic in several ways: (1) to prospectively test whether anxiety and depression increased from the month before a statewide Stay-At-Home order to during the order; and (2), extend prior work indicating that pre-crisis trait anxiety and GAD symptoms are related to crisis-related anxiety and depression (Farach et al., 2008; Weems et al., 2007) by testing whether pre-pandemic social anxiety would be predictive of greater anxiety, depressive, and COVID-related worry and interference during the Stay-At-Home order. We tested these relations in a sample of young adults from a university in Louisiana, a state with some of the worst COVID-related outcomes in the U.S. (von Springer, 2020) and the highest initial growth rate of confirmed cases of coronavirus anywhere in the world (WGNO Web Desk, 2020). Baseline assessment of social anxiety, trait anxiety, and depression occurred in the month leading up to their state's pandemic-related Stay-At-Home order and follow-up assessment occurred during the Stay-At-Home, one month following its enactment, offering a unique opportunity to prospectively examine the role of social anxiety as a potential risk factor for negative psychological sequelae arising in the context of this global pandemic.

2. Method

2.1. Participants and procedures

Participants were initially recruited through the psychology participant pool from a large state university in Louisiana from February 16, 2020 to March 13, 2020 for a study examining psychosocial functioning in college students. The university's Institutional Review Board approved the original study and participants provided informed consent prior to data collection. On March 13, 2020, the university closed the campus and transitioned to on-line learning in response to the COVID-19 pandemic and the state's governor issued a Stay-At-Home order on March 21, 2020. On 4/13/2020, the Institutional Review Board approved the present follow-up study and data collection occurred until the Phase 1 re-opening of the state on 5/15/2020. One hundred twenty participants completed computerized self-report measures at baseline and follow-up using a secure, on-line data collection website (Qualtrics.com). Participants received referrals to university-affiliated psychological outpatient clinics and the telephone number for the local crisis intervention hotline as well as research credit for completion of the surveys. Participants who completed the follow-up survey were also entered into a drawing to win one of four $250 prizes. The sample of 120 had a mean age of 19.8 ($SD = 1.6$) and racial/ethnic composition was 13.3% non-Hispanic/Latinx African American/Black, 4.2% Asian/Asian American, 76.7% Non-Hispanic/Latinx White, 3.3% Hispanic/Latinx White, and 2.5% Multiracial. Regarding social anxiety, 41.7% scored above the empirically supported clinical cut-score (Heimberg et al., 1992) on the *Social Interaction Anxiety Scale* (Mattick & Clarke, 1998), a conservative method to identify SAD among college students (Rodebaugh et al., 2006).

2.1.1. Measures

Demographics and COVID-19 Screening. Participants provided information on sex, age, and ethnicity. Participants also responded to 6 items related to COVID-19 diagnosis and exposure as well as recent international travel to areas highly impacted by COVID-19.

The *Social Interaction Anxiety Scale* (Mattick & Clarke, 1998) was used to assess social anxiety. The SIAS contains 20 items scored from 0 (*not at all characteristic or true of me*) to 4 (*extremely characteristic or true of me*). The SIAS has shown adequate specificity for social anxiety relative to other forms of anxiety (e.g., trait anxiety; Brown et al., 1997). Internal consistency of the SIAS at baseline was excellent in the current sample (α=.94).

The *Depression Anxiety Stress Scale* (DASS-21; Lovibond & Lovibond, 1995) was used to assess depression and trait anxiety. Each subscale contains seven items and has evidenced good internal consistency reliability, convergent and discriminant validity, and criterion-related validity (Antony et al., 1998). Internal consistency in the present study was good for anxiety (α=.88) and depression (α=.94)

COVID-19 Daily Activity Disruptions. Items were developed to assess changes in health behavioral following the COVID-19 pandemic. Items assessed difficulties with daily hygiene, sleeping, social connection, eating, motivation, maintaining a routine, exercising, and fatigue. Participants were asked to consider what is normal/typical for them and rate how true each statement was for them since the COVID-19 pandemic (0 = *not all true of me* to 3 = *very true*). These eight items were summed to create a total score (α=.83).

COVID-19 Worry Index. Guided by established assessments of worry, (Meyer et al., 1990), 15 items were developed to assess worry related to COVID-19 from 1 (*not at all*) to 7 (*a great deal*). Example items including "I am worried I will lose friends due to social distancing" and "I am worried I will not be able to handle being in quarantine." Items (15 items) were summed to create a total score (α=.92).

Four questions from the *Infrequency Scale* (IS; Chapman & Chapman, 1983) were used to identify random responders who provided random or grossly invalid responses. As in prior online studies (Cohen et al., 2009), individuals who endorsed three or more items at either baseline or follow-up assessment would have been excluded (n=0).

3. Results

At follow-up, no participant had been diagnosed with COVID, although 5.1% thought they may have COVID-19 but had not been tested, 5.9% had been exposed to someone who had a confirmed case of COVID-19, 7.6% had been exposed to someone who had been tested for COVID-19 and was awaiting results, 2.5% had traveled to/from an area with community spread COVID-19 within the past 3 months (e.g., China, Italy), and 49.2% were in New Orleans, for a Mardi Gras parade in 2020, which is noteworthy given that New Orleans is considered an epicenter of the state's pandemic (Edwards, 2020).

Means, standard deviations, and correlations among study variables are presented in Table 1. All variables were significantly correlated with one another. Results of paired-samples t tests indicated no change in social anxiety, $t(108) = -0.45$, $p = .651$, *95% CI*[-2.66, 1.67], or trait anxiety, $t(105) = -0.35$, $p = .726$, *95% CI*[-1.76, 1.23]. There was, however, a statistically significant increase in depression, $t(105) = 4.15$, $p < .001$, *95% CI*[1.99, 5.63]. Age, sex, and race/ethnicity were all unrelated to criterion variables (*ps*>.05).

Next, a series of hierarchical regression analyses were conducted to determine if pre-Stay-At-Home Order social anxiety, trait anxiety, and depression predicted anxiety and depression during the Stay-At-Home Order as well as COVID-related worry and interference (Table 2). In all models, pre-Stay-At-Home Order anxiety and depression were entered into Step 1, along with COVID-related variables. Pre-Stay-At-Home Order social anxiety was entered into Step 2. This approach ensures that effect at Step 2 cannot be attributed to variance shared with variables in Step 1 (Cohen & Cohen, 1983). In the first model, anxiety during the Stay-At-Home Order was entered as the criterion variable. This model was statistically significant, such that the variables in Step 1 accounted for 45.8% of the variance in anxiety during the Stay-At-Home Order, with pre-Stay-At-Home Order social anxiety uniquely accounting for an additional 5.1%. Notably, pre-Stay-At-Home Order depression was no longer statistically significantly related to anxiety during the Stay-At-Home Order when accounting for variance attributable to pre-Stay-At-Home Order anxiety. In the second model, depression during the Stay-At-Home Order was entered as the criterion variable, and this model was also statistically significant, such that the variables in Step 1 accounted for 50.4% of the variance in depression during the Stay-At-Home Order, with social anxiety uniquely accounting for an additional 4.9%. In the third model, COVID-related worry was entered as the criterion variable, and this model was also statistically significant,

Table 1
Means, standard deviations, and correlations among study variables.

Variables	*M*	*SD*	1	2	3	4	5	6	7	8
1.Baseline Social Anxiety	31.59	16.23								
2. Baseline Anxiety	7.92	9.53	.41**							
3. Baseline Depression	9.15	11.19	.44**	.78**						
4. Follow-up Social Anxiety	30.39	16.34	.75**	.28**	.26**					
5. Follow-up Anxiety	7.87	8.66	.46**	.65**	.54**	.48**				
6. Follow-up Depression	13.15	11.54	.48**	.61**	.66**	.56**	.78**			
7. COVID Worry Follow-up	47.65	18.63	.39**	.29**	.25**	.42**	.40**	.46**		
8. COVID Interference Follow-up	13.36	5.73	.42**	.42**	.35**	.40**	.47**	.66**	.47**	

Note.
** $p < .01$

Table 2
Hierarchical regressions for pre-pandemic anxiety, depression, and social anxiety prospectively predicting anxiety, depression, and COVID-related worry and interference after accounting for COVID-related covariates[1]

	ΔR^2	ΔF	β	*t*	*p*	sr^2
DV: Pandemic Anxiety						
Step 1	.458	11.84			<.001	
COVID Diagnosis			.12	1.61	.111	.01
Exposure to COVID			-.01	-0.06	.950	.00
Exposure to someone awaiting COVID test results			.09	1.04	.301	.01
Travel to and from COVID outbreak area			-.10	-1.24	.219	.01
In New Orleans for Mardi Gras			-.05	-0.71	.481	.00
Pre-Pandemic Anxiety			.57	4.70	<.001	.12
Pre-Pandemic Depression			.08	0.66	.510	.00
Step 2	.051	10.08			.002	
Pre-Pandemic Social Anxiety			.25	3.18	.002	.05
DV: Pandemic Depression						
Step 1	.504	14.21			<.001	
Pre-Pandemic Anxiety			.25	2.14	.035	.02
Pre-Pandemic Depression			.44	3.83	<.001	.07
Step 2	.049	10.66			.002	
Pre-Pandemic Social Anxiety			.25	3.27	.002	.05
DV: COVID-related worry						
Step 1	.096	1.66			.127	
Pre-Pandemic Anxiety			.22	1.48	.143	.02
Pre-Pandemic Depression			.07	0.49	.622	.00
Step 2	.091	12.11			.001	
Pre-Pandemic Social Anxiety			.34	3.48	.001	.09
DV: COVID-related interference						
Step 1	.220	4.42			<.001	
Pre-Pandemic Anxiety			.37	2.68	.009	.05
Pre-Pandemic Depression			.05	0.38	.701	.00
Step 2	.075	11.64			.001	
Pre-Pandemic Social Anxiety			.31	3.41	.001	.08

Note. Social anxiety was assessed with the *Social Interaction Anxiety Scale* (SIAS; Mattick & Clarke, 1998), and depression and trait anxiety with the *Depression Anxiety Stress Scale* (DASS-21; Lovibond & Lovibond, 1995). β =standardized beta coefficient

[1] The pattern of the COVID-related covariates was the same for all models; thus to streamline table, data are presented for first model as illustrative example. Complete data are available from the first author upon request.

such that the variables in Step 1 accounted for 9.6% of the variance in COVID-related worry, with social anxiety uniquely accounting for an additional 9.1%. Notably, pre-Stay-At-Home Order anxiety and depression were no longer statistically significantly related to COVID-related worry. In the fourth model, COVID-related interference was entered as the criterion variable, and this model was also statistically significant, such that the variables in Step 1 accounted for 22.0% of the variance in COVID-related interference, with social anxiety uniquely accounting for an additional 7.5%. Notably, pre-Stay-At-Home Order depression was no longer statistically significantly related to COVID-related interference.

To understand the nature of the COVID-related interference related to pre-Stay-At-Home Order affective variables, correlations were examined among pre-Stay-At-Home Order social anxiety, anxiety, depression, and interference scores at the item level (Table 3). Social anxiety was statistically significantly, positively related to trouble keeping up with daily hygiene, sleeping, keeping in contact with family and friends, feeling motivated, keeping a daily routine, and exercising, as well as eating unhealthier and feeling more fatigued. Pre-Stay-At-Home Order anxiety was similarly related to all interference items and depression was statistically significantly related to all items except unhealthy eating.

4. Discussion

To the best of our knowledge, this is the first known study of prospective predictors of pre-Stay-At-Home Order affective variables in the prediction of anxiety and depression during the COVID-19 pandemic's Stay-At-Home Orders. Results indicated depression, but not trait or social anxiety, increased from the month prior to the state-wide Stay-At-Home order to the month after the order was issued. That depression increased during the first month of the Stay-At-Home order is noteworthy given that prior work found no increase in depression in response to other broad-scale disasters (Weems et al., 2007), suggesting that either the nature of the COVID-19 pandemic and/or the Stay-At-Home order may uniquely increase depressive symptoms.

Interestingly, depression, anxiety, and stress increased among adult community-recruited participants from the first week of Italy's COVID-19-related Stay-At-Home order to the last week of the order and individuals with pre-existing mental health disorders were especially vulnerable to these increases (Fiorillo et al., 2020). When considered in light of our findings, these data suggest that among college students, depression was higher during the first month of the COVID-19 pandemic-related Stay-At-Home order and among community adults, depression, anxiety, and stress increased from the first week to the last week of the Stay-At-Home order. Future work is necessary to determine whether anxiety and stress also increased from the first to last weeks of the order among college students to determine whether the increase in anxiety and stress is due to concerns that may be more specific to non-college adults, such as loss of income associated with the Stay-At-Home order.

Notably, our study is one of the first known studies to examine the impact of pre-Stay-At-Home affective variables (e.g., social anxiety) and its impact on psychological functioning during Stay-At-Home orders among college students. In line with findings from Hurricane Katrina (Weems et al., 2007), pre-Stay-At-Home Order trait anxiety predicted anxiety and depression during the Stay-At-Home Order. However, counter to Weems et al. in which pre-Katrina depression was unrelated to follow-up anxiety or depression, pre-Stay-At-Home Order depression predicted depression and anxiety during the Stay-At-Home Order; again, highlighting that the response to the emotional toll of the COVID-19 pandemic may be unique from other crises experienced in this region. Further extending prior work, social anxiety also predicted anxiety and depression during the pandemic. Notably, results also indicated that social anxiety was a robust predictor of both trait anxiety and depression

Table 3
Means, standard deviations, and correlations among COVID study variables at the item level.

Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11
1.Pre-Pandemic Social Anxiety	31.59	16.23											
2. Pre-Pandemic Anxiety	7.92	9.53	.41**										
3. Pre-Pandemic Depression	9.15	11.19	.44**	.78**									
4. Daily hygiene	0.84	0.96	.26**	.24**	.25**								
5. Sleep Problems	1.55	1.14	.30**	.23*	.31**	.23*							
6. Social Support	1.25	1.06	.22*	.25**	.28**	.36**	.29**						
7. Unhealthy eating	1.59	1.12	.25**	.31**	.14	.34**	.28**	.26**					
8. Lack of work motivation	2.42	0.91	.22*	.28**	.23*	.33**	.32**	.24**	.51**				
9. Daily routine	2.14	0.99	.29**	.22*	.15	.51**	.37**	.26**	.47**	.58**			
10. Exercise	1.80	1.14	.37**	.37**	.21*	.45**	.26**	.20*	.52**	.38**	.54**		
11. Fatigue	1.77	1.07	.37**	.40**	.35**	.45**	.41**	.28**	.45**	.51**	.55**	.61**	

Note.
* $p < .05$,
** $p < .01$

during the Stay-At-Home Order, as well as a unique predictor of COVID-related worry (which was not the case for pre-Stay-At-Home Order depression or anxiety) and a robust predictor COVID-related interference (which was not the case for pre-Stay-At-Home Order).

Results have several important broadscale implications for psychological health and general wellbeing. First, they highlight that depression increased as a result of the COVID-19 pandemic's state-wide Stay-At-Home order. Thus, interventions to teach individuals skills to manage depression could improve functioning during the COVID-19 pandemic or even post-pandemic. Second, results indicated that individuals with social anxiety may be especially vulnerable to experiencing anxiety, depression, and COVID-related worry and interference during the COVID-19 pandemic. Thus, these individuals may especially benefit from cognitive behavioral strategies to manage their negative affect, including strategies to manage their behavioral reactions to the pandemic, such as sleep hygiene (National Sleep Foundation, 2020) and exercise. Exercise may be especially useful given data indicating that it can be useful for decreasing anxiety (Stubbs et al., 2017).

Findings must be considered in light of limitations that can inform future work geared toward understanding the affective impact of the COVID-19 pandemic and associated government Stay-At-Home orders. First, the sample consisted largely of White female young adults and it will be important to test whether results generalize to other samples (e.g., non-college persons, older persons, other racial/ethnic groups). This work is especially important in light of evidence that men and women may experience differential mental health outcomes during the COVID-19 Stay-At-Home orders (Fiorillo et al., 2020; Khubchandani et al., 2020); unfortunately, our sample was comprised of too few male participants to test whether sex moderated outcomes. Further work with more diverse samples is also necessary given that the negative health effects of COVID-19 are especially problematic among individuals with pre-existing health conditions (e.g., heart disease, immunocompromised, diabetes), older individuals (Centers for Disease Control and Prevention, 2020), and Black and Hispanic/Latinx Americans, most likely due to health disparities and institutional racism rather than individual-level factors (Erdman, 2020); thus, future work is necessary to determine the emotional impact of this pandemic and its associated Stay-At-Home order and other mitigation measures on these high-risk individuals.

Second, a non-clinical sample was employed and an important next step will be to test whether results generalize to clinical samples. It may be that clinical samples may be more vulnerable to the adverse mental health effects of COVID-19, as has been found in other disasters (Zvolensky et al., 2015). In fact, individuals receiving outpatient telehealth services during the Stay-At-Home order and those who were diagnosed with psychiatric disorders endorsed elevated levels of posttraumatic stress during Stay-At-Home orders compared to individuals who did not have pre-existing mental health conditions (Carmassi et al., 2020; Hao et al., 2020), and these symptoms were especially elevated among women with Bipolar disorder (Carmassi et al., 2020). Third, data were collected via self-reports. Future work could benefit from multi-method (e.g., ecological momentary assessment of momentary predictors of increases in state anxiety, depression, worry, etc.) and multi-informant (e.g., collateral reports of COVID-related impairment) approaches. Fourth, most states no longer have mandated Stay-At-Home orders, although most do encourage social distancing and other mitigation measures. Consequently, an important next step will be to test whether results are unique to staying at home during a pandemic or whether they continue once individuals are permitted more social interaction.

The current study provides invaluable information on some of the affective consequences of the COVID-19 pandemic and associated government Stay-At-Home orders. Data indicate that depression, but not anxiety, has increased during the pandemic's Stay-At-Home order and this was especially the case among individuals with elevated pre-Stay-At-Home Order anxiety, social anxiety, and depression. Further, individuals with elevated pre-Stay-At-Home Order social anxiety are suffering from greater levels of COVID-related worry and interference, thus identifying an especially vulnerable group.

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CRediT authorship contribution statement

Julia D. Buckner: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Cristina N. Abarno:** Writing – original draft, Writing – review & editing. **Elizabeth M. Lewis:** Writing – original draft, Writing – review & editing. **Michael J. Zvolensky:** Methodology, Writing – original draft, Writing – review & editing. **Lorra Garey:** Writing – original draft, Writing – review & editing.

Declaration of Competing Interests

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