

Supplemental Information for:
“Which anxious adolescents are most impacted by the COVID-19 pandemic?”

Santiago Morales^{1,2,3*}, Selin Zeytinoglu¹, Nicole E. Lorenzo¹, Andrea Chronis-Tuscano⁴, Kathryn A. Degnan⁵, Alisa N. Almas⁶, Daniel S. Pine⁷, Nathan A. Fox^{1,2}.

¹ Department of Human Development and Quantitative Methodology, University of Maryland – College Park

² Neuroscience and Cognitive Science Program, University of Maryland – College Park

³ Department of Psychology, University of Southern California

⁴ Department of Psychology, University of Maryland - College Park

⁵ Department of Psychology, Catholic University

⁶ School of Population and Public Health, University of British Columbia

⁷ Emotion and Development Branch, National Institute of Mental Health Intramural Research Program, National Institute of Mental Health

Corresponding Author: Santiago Morales (santiago.morales@usc.edu) – 501 Seeley G. Mudd Building University of Southern California, Los Angeles 90089

Methodological Details

General and Social Anxiety Latent Factors

To evaluate if the trajectories of anxiety varied as a function of previous anxiety levels, we created two anxiety latent factors. To create a robust measure of generalized and social anxiety, each factor included the three measures of anxiety from adolescence (child reports, parent reports, and clinical diagnosis) as indicators for generalized and social anxiety respectively. As shown in Table S1, we fit a confirmatory factor analysis of only the measurement model for these social and generalized anxiety factors, finding that all measures significantly loaded onto their relevant factor and the model showed excellent fit ($\chi^2(6) = 3.36$, $p = .76$; RMSEA = .00, CFI = 1.0, SRMR = .03). The two factors were significantly related ($r = .61$, $p < .001$).

Table S1. Factors loadings of the preliminary confirmatory factor analysis of the generalized and social anxiety factors.

Indicator	Loadings	<i>p</i> value
<u>Generalized Anxiety Factor</u>		
CR Generalized Anxiety	0.57	0.000
PR Generalized Anxiety	0.74	0.000
Generalized Anxiety Diagnosis	0.68	0.000
<u>Social Anxiety Factor</u>		
CR Social Anxiety	0.81	0.000
PR Social Anxiety	0.64	0.000
Social Anxiety Diagnosis	0.52	0.000

Note: All factor loadings are from the standardized solution. The residual variances for the individual indicators were allowed to co-vary across the same measures (i.e., parent reports, child reports, and clinical interviews).

COVID-Related Worries

COVID-related worries were measured using an adapted version of the COVID-19 Adolescent Symptom & Psychological Experience Questionnaire (CASPE; Ladouceur, 2020). The scale used had 18 items and questions consisted of various concerns and stressors about the COVID-19 pandemic or concerns related to disruptions caused by the pandemic. For each item, participants were asked to rate their level of worry or stress using a scale from 1 (very little or not at all) to 5 (A great deal or extremely) with an option for non-applicable. Item scores were averaged to create an overall score. Higher scores indicated greater COVID-19 related worries. The scale showed adequate internal consistency at all time points (α 's > .88) and good test re-test reliability (r s > .73). Below is a full list of the items:

Table S2. Items on the COVID-Related Worries Scale.

Item	Question
1	COVID-19 presents a lot of uncertainty about the future. In the last 2 weeks, including today, how stressful have you found this uncertainty to be?
2	The COVID-19 outbreak has changed and disrupted many existing plans. In the last 2 weeks, including today, how stressful do you find these disruptions to be?
3	COVID-19 is a novel virus. In the last 2 weeks, including today, how worried were you that someone in your household or extended family (i.e., grandparent, uncle/aunt, cousin) might become sick?
In the last 2 weeks, including today, how worried have you been about the impact of COVID-19 outbreak on the following:	
4	Having to stay at home
5	Not seeing friends in person
6	You might get sick
7	Family might get sick
8	Friends might get sick
9	Doing something that would cause someone else to get sick
10	Having to spend more time with family
11	People might die if they get sick
12	Parent will lose their job
13	Having enough food and physical resources (e.g. cleaning supplies, toilet paper, medicine) at home
14	Conflict with parents
15	Conflict with siblings
16	Not getting into or continuing to go to college
17	Not having enough money
18	Missing events that were important to me (e.g. graduation, birthday parties, prom, vacations)

Sensitivity Analyses

Non-linear Trajectories

In order to examine potential non-linear trajectories, we modeled the trajectories using the means of the sample – such that we used 0, 1, and 1.93 for anxiety; 0, 1, 1.73 for perceived stress; and 0, 1, 1.69 for COVID-related worries, rather than 0, 1, 2 for all the outcomes. The fit of these non-linear models and the models presented in the main manuscript using a linear trajectory were almost identical. Moreover, the results using these non-linear trajectories and the linear trajectories were similar, leading to the same conclusions. This suggests that modeling the trajectories using linear slopes is a justifiable methodological decision.

Table S3. *Conditional latent growth curve analysis regression results for three models including pre-pandemic anxiety predictors.*

Predictors/Outcome	β	b	p	β	b	p	β	b	p
	Anxiety Intercept			Perceived Stress Intercept			COVID-Related Worries Intercept		
Maternal Education	0.13	0.95	0.113	0.10	0.86	0.316	0.08	0.07	0.356
Maternal Ethnicity	-0.03	-0.36	0.737	-0.07	-0.98	0.508	-0.08	-0.11	0.366
Gender	-0.08	-0.84	0.351	-0.23	-2.81	0.010	-0.32	-0.44	0.000
Date of 1st Assessment	-0.06	-0.05	0.382	-0.04	-0.04	0.639	-0.04	0.00	0.584
Age (Pandemic)	-0.02	-0.19	0.752	-0.06	-0.54	0.505	0.08	0.08	0.345
Generalized Anxiety	0.62	1.25	0.000	0.56	1.24	0.000	0.39	0.10	0.001
Social Anxiety	-0.32	-0.54	0.027	-0.55	-1.06	0.001	-0.39	-0.09	0.006
	Anxiety Slope			Perceived Stress Slope			COVID-Related Worries Slope		
Maternal Education	-0.06	-0.13	0.605	0.14	0.30	0.562	-0.03	-0.01	0.852
Maternal Ethnicity	0.17	0.56	0.193	0.00	0.00	0.997	0.19	0.09	0.243
Gender	0.09	0.27	0.483	-0.07	-0.22	0.714	0.08	0.04	0.485
Date of 3rd Assessment	-0.13	-0.04	0.195	-0.30	-0.08	0.135	0.14	0.01	0.151
Age (Pandemic)	0.02	0.05	0.879	0.15	0.36	0.487	0.25	0.08	0.022
Generalized Anxiety	-0.32	-0.19	0.213	-0.17	-0.10	0.703	0.03	0.00	0.883
Social Anxiety	0.51	0.25	0.040	0.89	0.43	0.047	0.19	0.01	0.396

Note: Generalized Anxiety and Social Anxiety are latent factors composed of pre-pandemic clinical diagnoses, parent and child reports of anxiety; Gender is coded as 0 = Girls and 1 = Boys; Maternal Ethnicity is coded as Non-Hispanic Caucasian = 1 and Other = 0; Maternal education was coded as High school graduate = 0, College Graduate = 1, Graduate school graduate = 2, and Other = missing. All models had acceptable fit: Anxiety model ($\chi^2(65) = 99.95, p = .003, RMSEA = .04, SRMR = .07, CFI = .94$), Perceived Stress model ($\chi^2(65) = 115.19, p < .001, RMSEA = .05, SRMR = .08, CFI = .90$), and COVID-related worries model ($\chi^2(65) = 92.33, p = .015, RMSEA = .04, SRMR = .08, CFI = .96$). COVID is the coronavirus disease of 2019. β and b represent the standardized and unstandardized regression coefficients, respectively. p represents the p value.

Examining the impact of the variability in age in the adolescent assessment

In order to explore the potential impact of the variability in age in the adolescent assessment, we examined interactions between the social and generalized anxiety factors and the age of the participants during the adolescent assessment. When estimating these more complex models with latent interactions, we encountered convergence issues. Specifically, we followed the double-mean-centering approach (Lin et al., 2010), but encountered convergence issues when including all the covariances among the product indicators and the variables that composed them. As expected, the models without those covariances had poor fit. However, following modification indices, we were able to fit models that included the covariance between the product indicators involving the parent and child reports of social and generalized anxiety in the SCARED. Although these models still did not have good fit, they had acceptable fit (see below). Importantly, as shown in Table S4, none of the interactions were significant and the main effects, even with the interactions present, were similar to the ones originally reported. This suggests that the age of assessment in adolescence did not significantly impact the results presented in the manuscript.

Table S4. *Conditional latent growth curve analysis regression results for three models including pre-pandemic anxiety predictors.*

Predictors/Outcome	β	<i>b</i>	<i>p</i>	β	<i>b</i>	<i>p</i>	β	<i>b</i>	<i>p</i>
	Anxiety Intercept			Perceived Stress Intercept			COVID-Related Worries Intercept		
Maternal Education	0.12	0.85	0.158	0.09	0.77	0.346	0.06	0.05	0.494
Maternal Ethnicity	-0.03	-0.37	0.730	-0.08	-1.03	0.463	-0.06	-0.09	0.460
Gender	-0.10	-1.06	0.316	-0.22	-2.68	0.021	-0.29	-0.40	0.001
Age (Adolescence)	0.05	0.41	0.722	0.15	1.51	0.181	0.22	0.25	0.021
Date of 1st Assessment	-0.06	-0.05	0.390	-0.04	-0.04	0.606	-0.05	-0.01	0.429
Age (Pandemic)	-0.03	-0.22	0.753	-0.12	-1.12	0.225	-0.02	-0.02	0.856
Generalized Anxiety	0.67	1.30	0.000	0.59	1.23	0.000	0.38	0.10	0.003
Social Anxiety	-0.35	-0.62	0.046	-0.58	-1.14	0.002	-0.38	-0.09	0.016
Age (Adolescence) x Generalized Anxiety	-0.24	-0.62	0.326	-0.37	-1.05	0.132	-0.12	-0.04	0.522
Age (Adolescence) x Social Anxiety	0.32	0.96	0.507	0.23	0.78	0.508	0.01	0.00	0.966
	Anxiety Slope			Perceived Stress Slope			COVID-Related Worries Slope		
Maternal Education	-0.04	-0.08	0.741	0.17	0.34	0.439	-0.02	-0.01	0.884
Maternal Ethnicity	0.18	0.55	0.192	0.01	0.03	0.961	0.16	0.07	0.273
Gender	0.14	0.39	0.329	-0.10	-0.30	0.600	-0.02	-0.01	0.852
Age (Adolescence)	-0.17	-0.40	0.373	-0.44	-1.04	0.133	-0.10	-0.03	0.567
Date of 3rd Assessment	-0.11	-0.03	0.249	-0.22	-0.06	0.244	0.12	0.00	0.224
Age (Pandemic)	0.05	0.10	0.749	0.37	0.80	0.105	0.32	0.10	0.006
Generalized Anxiety	-0.43	-0.23	0.170	-0.25	-0.13	0.578	0.05	0.00	0.807
Social Anxiety	0.55	0.27	0.061	0.94	0.44	0.033	0.24	0.02	0.235
Age (Adolescence) x Generalized Anxiety	0.42	0.29	0.562	0.19	0.13	0.809	-0.24	-0.02	0.405
Age (Adolescence) x Social Anxiety	-0.62	-0.51	0.544	-0.30	-0.24	0.742	0.61	0.07	0.059

Note: Generalized Anxiety and Social Anxiety are latent factors composed of pre-pandemic clinical diagnoses, parent and child reports of anxiety; Gender is coded as 0 = Girls and 1 = Boys; Maternal Ethnicity is coded as Non-Hispanic Caucasian = 1 and Other = 0; Maternal education was coded as High school graduate = 0, College Graduate = 1, Graduate school graduate = 2, and Other = missing. All models had acceptable fit: Anxiety model ($\chi^2(161) = 266.75, p < .001, RMSEA = .05, SRMR = .09, CFI = .90$), Perceived Stress model ($\chi^2(161) = 261.00, p < .001, RMSEA = .05, SRMR = .10, CFI = .89$), and COVID-related worries model ($\chi^2(161) = 237.23, p = .015, RMSEA = .04, SRMR = .09, CFI = .92$). COVID is the coronavirus disease of 2019. β and *b* represent the standardized and unstandardized regression coefficients, respectively. *p* represents the *p* value.

Predicting Anxiety before the Pandemic

In order to examine if the results found were specific to the pandemic, we conducted the same analyses in a subsample of participants ($n = 56$) that reported on their anxiety using the SCARED (Birmaher et al., 1997) right before the start of the pandemic in February 2020. As shown in Table S5, examining relations between anxiety in adolescence and this assessment before the pandemic, we found that both social and generalized anxiety adolescent variables are longitudinally related with the generalized anxiety scale from the SCARED (except clinical diagnosis of social anxiety – albeit this was with a small sample, $n = 37$). Moreover, as shown in Table S6, when examining these relations in a SEM model including both social and generalized anxiety as latent predictors of later anxiety, only generalized anxiety was predictive of later anxiety. Although social anxiety was not significantly related after accounting for generalized anxiety, social anxiety was not significantly negatively related as observed at the start of the pandemic – a few months after. Importantly, this analysis is only supplemental and should be interpreted with caution as it is only with a subsample of participants and does not use the same anxiety scale as the main analyses. In light of these limitations, the results from this analysis suggests that generalized and social anxiety showed more similar predictions to anxiety before the pandemic than the pattern of relations observed a few months later during the initial phase of the pandemic.

Table S5. Means, standard deviations, and correlations

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Gender	291	*										
2. Maternal Ethnicity	290	**		-.05								
3. Maternal Education	273	1.21	0.72	.01	.19							
4. Gen Anx Self	162	7.64	4.42	-.27	.11	-.07						
5. Gen Anx Parent	177	4.38	3.98	-.20	.14	-.10	.41					
6. Gen Anx Clinical	151	***		-.07	.07	-.00	.40	.49				
7. Social Anx Self	162	5.58	3.80	-.31	-.09	-.14	.52	.38	.33			
8. Social Anx Parent	178	3.81	3.65	-.26	.06	-.15	.27	.60	.21	.55		
9. Social Anx Clinical	151	***		-.09	.11	-.07	.22	.33	.26	.43	.34	
10. Pre-Pandemic Anxiety	56	8.05	4.95	-.07	.02	-.24	.66	.49	.37	.41	.30	.14

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. *N* is the sample size for that measure. Bold indicates $p < .05$. * 0 = Girls (53.6%) and 1 = Boys (46.4%). ** 1 = Non-Hispanic Caucasian (69.4%) and 0 = Other (30.2%). *** 1 = Clinical diagnosis (13.2% General and 15.9% Social) and 0 = no diagnosis. Maternal education was coded as High school graduate = 0, College Graduate = 1, Graduate school graduate = 2, and Other = missing. Gen Anx is generalized anxiety. Social Anx is social anxiety. Self is adolescent self-report. Parent is parent-reports. Clinical is clinical diagnosis. T1, T2, and T3 represent the first, second, and third assessments during the COVID-19 pandemic, respectively. COVID is the coronavirus disease of 2019.

Table S6. *Regression results for the model predicting pre-pandemic anxiety.*

Predictors/Outcome	β	<i>b</i>	<i>p</i>
	Pre-pandemic Anxiety		
Maternal Education	-0.09	-0.58	0.464
Maternal Ethnicity	-0.03	-0.33	0.795
Gender	0.11	1.08	0.373
Generalized Anxiety	0.64	1.12	0.000
Social Anxiety	-0.01	-0.01	0.962

Note: Generalized Anxiety and Social Anxiety are latent factors composed of pre-pandemic clinical diagnoses, parent and child reports of anxiety; Gender is coded as 0 = Girls and 1 = Boys; Maternal Ethnicity is coded as Non-Hispanic Caucasian = 1 and Other = 0; Maternal education was coded as High school graduate = 0, College Graduate = 1, Graduate school graduate = 2, and Other = missing. This model had acceptable fit based on most fit indices ($\chi^2(28) = 54.95, p = .002, RMSEA = .06, SRMR = .09, CFI = .91$). β and *b* represent the standardized and unstandardized regression coefficients, respectively. *p* represents the *p* value.