

## Supplement 1

### Sensitivity Analyses

#### 1) Examination of an alternative behavioral inhibition composite.

**Rationale:** Different papers with this longitudinal sample use slightly different measures of behavioral inhibition (BI) depending on their main question of interest, including a BI composite that also includes parent-reports of fearful temperament.<sup>1,2</sup> In the present study, we wanted to only focus on behavioral observations of BI as they most closely match the observed social wariness measure. However, to examine the robustness of our results, we also examined our main model with this composite.

**Alternative Measurement of BI:** This alternative composite of BI was also assessed at 24 and 36 months of age using behavioral coding of laboratory assessments, but it also included parental report. In addition to the laboratory assessments reported in the main text, maternal report of social fear was collected using the Toddler Behavior Assessment Questionnaire. Behavioral coding and parental reports of BI were significantly associated,  $r = 0.48, p < .001$ . As in previous work, measures were standardized and averaged to create a BI composite. The goal of this composite is that combining data from different contexts, informants, and ages provides a more comprehensive measure of child's temperament.

**Results:** As shown in Table S1, the results from this model were similar to the results from the main model presented in the manuscript. Although there was no main effect of BI on adolescent worry dysregulation, the interaction between toddlerhood BI and childhood social wariness predicted adolescents' worry dysregulation, which in turn predicted elevated anxiety at the 2<sup>nd</sup> assessment of the COVID-19 pandemic. Moreover, probing the interaction revealed the same pattern of results – such that higher toddlerhood BI predicted more worry dysregulation at 15 years at high levels of social wariness at 7 years (+1SD;  $b = 0.17, p < .001$ ), but not at low levels of social wariness (-1SD;  $b = -0.02, p = .68$ ). Finally, examining the conditional indirect effect also showed the same pattern of results such that individuals high in early BI, who continued to display high levels of social wariness during childhood, reported more worry dysregulation, which led to greater anxiety at Month 2 of the pandemic,  $b = 0.24, 95\%CI [0.024, 0.622]$ . This developmental pathway was not significant for children who displayed low levels of social wariness in childhood,  $b = -0.03, 95\%CI [-0.296, 0.119]$ .

**Conclusion:** The results using this different composite of BI yielded similar results, leading to the same conclusions, suggesting that the BI composite used does not significantly impact the results and their interpretations.

Table S1. Path Analysis Results for the Moderated Mediation Model Using an Alternative Behavioral Inhibition Composite.

Predictors/Outcome	$\beta$	$b$	$p$	CI Lower	CI Upper
<u>Anxiety Month 2</u>					
<b>Anxiety Month 1</b>	<b>0.80</b>	<b>0.72</b>	<b>0.000</b>	<b>0.616</b>	<b>0.819</b>
Behavioral Inhibition	0.01	0.08	0.814	-0.569	0.724
Maternal Education	-0.04	-0.31	0.312	-0.912	0.291
<b>Maternal Race/Ethnicity</b>	<b>0.10</b>	<b>1.13</b>	<b>0.030</b>	<b>0.113</b>	<b>2.153</b>
Gender	0.06	0.58	0.248	-0.407	1.575
Time between Assessments	0.08	0.06	0.139	-0.018	0.128
Age during COVID-19	0.00	0.01	0.970	-0.720	0.749
<b>Date of Assessment</b>	<b>-0.12</b>	<b>-0.11</b>	<b>0.027</b>	<b>-0.215</b>	<b>-0.013</b>
<b>Worry Dysregulation</b>	<b>0.12</b>	<b>1.36</b>	<b>0.023</b>	<b>0.190</b>	<b>2.537</b>
<u>Worry Dysregulation</u>					
Behavioral Inhibition	0.12	0.07	0.090	-0.012	0.161
Social Wariness	0.04	0.03	0.645	-0.083	0.134
Behavioral Inhibition x Social Wariness	<b>0.18</b>	<b>0.15</b>	<b>0.001</b>	<b>0.059</b>	<b>0.243</b>
<b>Gender</b>	<b>-0.27</b>	<b>-0.25</b>	<b>0.000</b>	<b>-0.385</b>	<b>-0.116</b>

Note: Anxiety Month 1 and Anxiety Month 2 represent the first and second anxiety assessments during the COVID-19 pandemic, respectively. Gender is coded as 0 = Female Participants and 1 = Male Participants; Maternal Race/Ethnicity is coded as 1 = White and 0 = Other Race/Ethnicity.

## 2) Examination of an alternative worry dysregulation scale.

**Rationale:** The worry dysregulation scale used in the main manuscript has been validated with only 3 items.<sup>3</sup> However, extensive expression of worried feelings could also be considered as worry dysregulation. Consistent with this, principal component analysis conducted in this sample suggested including in this composite a fourth item: “I show my worried feelings.” As such, for a robustness check, we tested the main model using the worry dysregulation scale involving 4 items. This 4-item composite displayed better internal consistency in our sample ( $\alpha = .61$ ) than the traditional 3-item scale.

**Results:** As shown in Table S2, the results from this model were similar to the results from the study’s main model using the original worry dysregulation scale (including 3 items). The interaction between toddlerhood BI and childhood social wariness predicted adolescents’ worry dysregulation, which in turn predicted elevated anxiety at the 2<sup>nd</sup> assessment of the COVID-19 pandemic. Moreover, probing the interaction revealed the same pattern of results – such that higher toddlerhood BI predicted more worry dysregulation at 15 years at high levels of social wariness at 7 years (+1SD;  $b = 0.31, p < .001$ ), but not at low levels of social wariness (-1SD;  $b = 0.03, p = .721$ ). Finally, examining the conditional indirect effect also showed the same pattern of results such that individuals high in early BI, who continued to display high levels of social wariness during childhood, reported more worry dysregulation, which led to greater anxiety at Month 2 of the pandemic,  $b = 0.47, 95\%CI [0.062, 1.212]$ . This developmental pathway was not

significant for children who displayed low levels of social wariness in childhood,  $b = 0.05$ , 95%CI [-0.254, 0.404].

**Conclusion:** The results using this data-driven composite with higher reliability yielded similar results, leading to the same conclusions, suggesting that the way of calculating the worry dysregulation scale does not significantly impact the results and their interpretations.

Table S2. Path Analysis Results for the Moderated Mediation Model Using the 4-Item Worry Dysregulation Scale.

<b>Predictors/Outcome</b>	<b><math>\beta</math></b>	<b><math>b</math></b>	<b><math>p</math></b>	<b>CI Lower</b>	<b>CI Upper</b>
<u>Anxiety Month 2</u>					
<b>Anxiety Month 1</b>	<b>0.81</b>	<b>0.72</b>	<b>0.000</b>	<b>0.623</b>	<b>0.823</b>
Behavioral Inhibition	0.04	0.47	0.373	-0.565	1.506
Maternal Education	-0.04	-0.32	0.302	-0.915	0.284
<b>Maternal Race/Ethnicity</b>	<b>0.10</b>	<b>1.14</b>	<b>0.026</b>	<b>0.134</b>	<b>2.154</b>
Gender	0.06	0.63	0.212	-0.363	1.632
Time between Assessments	0.07	0.05	0.191	-0.024	0.120
Age during COVID-19	0.01	0.08	0.833	-0.645	0.801
<b>Date of Assessment</b>	<b>-0.11</b>	<b>-0.10</b>	<b>0.042</b>	<b>-0.204</b>	<b>-0.004</b>
<b>Worry Dysregulation</b>	<b>0.13</b>	<b>1.50</b>	<b>0.015</b>	<b>0.292</b>	<b>2.703</b>
<u>Worry Dysregulation</u>					
<b>Behavioral Inhibition</b>	<b>0.18</b>	<b>0.17</b>	<b>0.013</b>	<b>0.035</b>	<b>0.307</b>
Social Wariness	0.07	0.04	0.343	-0.047	0.136
<b>Behavioral Inhibition x Social Wariness</b>	<b>0.18</b>	<b>0.21</b>	<b>0.007</b>	<b>0.058</b>	<b>0.369</b>
<b>Gender</b>	<b>-0.27</b>	<b>-0.24</b>	<b>0.000</b>	<b>-0.363</b>	<b>-0.110</b>

Note: Anxiety Month 1 and Anxiety Month 2 represent the first and second anxiety assessments during the COVID-19 pandemic, respectively. Gender is coded as 0 = Female Participants and 1 = Male Participants. Maternal Race/Ethnicity is coded as 1 = White and 0 = Other Race/Ethnicity.

### 3) Testing the specificity of the developmental pathway via worry dysregulation by examining if other emotion regulation problems (i.e., anger and sadness dysregulation) mediate the link between childhood temperament and anxiety during COVID-19.

**Rationale:** In order to examine the robustness of the developmental pathway from toddlerhood BI to anxiety during COVID-19, we examined two additional models. Specifically, we examined whether two other child-reported emotion regulation problems (i.e., “anger dysregulation” and “sadness dysregulation”) mediate the relation between early temperament and elevated anxiety during COVID-19.

**Measurement of Anger and Sadness Dysregulation:** Adolescents’ anger and sadness dysregulation were assessed via children’s emotion management scales (CEMS).<sup>3,4</sup> Sadness dysregulation was measured via the Children’s Sadness Management Scale (CSMS).<sup>4</sup> whereas anger dysregulation was measured via the Children’s Anger Management Scale (CAMS).<sup>5</sup> The CEMS have acceptable reliability and validity.

**Results:** Table S3 presents results from the model examining the mediatory role of anger dysregulation in the relation between childhood temperament and anxiety during the COVID-19 pandemic. Results suggested that toddlerhood BI, childhood social wariness, or their interaction do not predict adolescents' anger dysregulation. However, greater anger dysregulation at age 15 predicted elevated anxiety during COVID-19. This finding suggests that although children with greater anger dysregulation may experience greater anxiety during the pandemic, anger dysregulation is not the mechanism linking early stable BI to anxiety during the pandemic.

As shown in Table S4, sadness dysregulation also did not mediate the relation between childhood temperament and young adults' anxiety during the COVID-19 pandemic. Specifically, although toddlerhood BI predicted greater sadness dysregulation at age 15, sadness dysregulation did not predict elevated anxiety during the pandemic.

**Conclusion:** Together, results from these two additional models suggest that neither anger dysregulation nor sadness dysregulation serve as the emotion dysregulation mechanism linking childhood BI to elevated anxiety during the COVID-19 pandemic. These results suggest that worry dysregulation may be a specific emotion regulation problem that mediates the association between early stable BI and anxiety during stressful life events such as the COVID-19 pandemic.

Table S3. Path Analysis Results for Moderated Mediation Model Using Anger Dysregulation.

<b>Predictors/Outcome</b>	<b><math>\beta</math></b>	<b><i>b</i></b>	<b><i>p</i></b>	<b>CI</b>	
				<b>Lower</b>	<b>Upper</b>
<u>Anxiety Month 2</u>					
<b>Anxiety Month 1</b>	<b>0.81</b>	<b>0.72</b>	<b>0.000</b>	<b>0.624</b>	<b>0.824</b>
Behavioral Inhibition	0.07	0.79	0.127	-0.225	1.814
Maternal Education	-0.05	-0.33	0.270	-0.928	0.260
<b>Maternal Race/Ethnicity</b>	<b>0.10</b>	<b>1.05</b>	<b>0.039</b>	<b>0.055</b>	<b>2.052</b>
Gender	0.02	0.18	0.724	-0.797	1.148
Time between Assessments	0.10	0.07	0.059	-0.003	0.142
Age during COVID-19	0.02	0.17	0.640	-0.555	0.904
<b>Date of Assessment</b>	<b>-0.13</b>	<b>-0.13</b>	<b>0.014</b>	<b>-0.225</b>	<b>-0.026</b>
<b>Anger Dysregulation</b>	<b>0.11</b>	<b>1.12</b>	<b>0.018</b>	<b>0.192</b>	<b>2.041</b>
<u>Anger Dysregulation</u>					
Behavioral Inhibition	-0.02	-0.02	0.829	-0.185	0.148
Social Wariness	-0.05	-0.04	0.548	-0.167	0.089
Behavioral Inhibition x Social Wariness	-0.05	-0.07	0.471	-0.246	0.114
Gender	0.08	0.08	0.320	-0.076	0.233

Note: Anxiety Month 1 and Anxiety Month 2 represent the first and second anxiety assessments during the COVID-19 pandemic, respectively. Gender is coded as 0 = Female Participants and 1 = Male Participants. Maternal Race/Ethnicity is coded as 1 = White and 0 = Other Race/Ethnicity.

Table S4. Path Analysis Results for Moderated Mediation Model Using Sadness Dysregulation.

Predictors/Outcome	$\beta$	<i>b</i>	<i>p</i>	CI	
				Lower	Upper
<u>Anxiety Month 2</u>					
<b>Anxiety Month 1</b>	<b>0.81</b>	<b>0.72</b>	<b>0.000</b>	<b>0.625</b>	<b>0.821</b>
Behavioral Inhibition	0.05	0.49	0.384	-0.612	1.592
Maternal Education	-0.06	-0.40	0.220	-1.033	0.237
<b>Maternal Race/Ethnicity</b>	<b>0.11</b>	<b>1.20</b>	<b>0.026</b>	<b>0.147</b>	<b>2.249</b>
Gender	0.05	0.49	0.337	-0.514	1.503
Time between Assessments	0.08	0.06	0.130	-0.017	0.132
Age during COVID-19	0.01	0.08	0.827	-0.657	0.822
<b>Date of Assessment</b>	<b>-0.12</b>	<b>-0.11</b>	<b>0.036</b>	<b>-0.213</b>	<b>-0.007</b>
Sadness Dysregulation	0.10	1.06	0.079	-0.122	2.236
<u>Sadness Dysregulation</u>					
<b>Behavioral Inhibition</b>	<b>0.22</b>	<b>0.23</b>	<b>0.006</b>	<b>0.066</b>	<b>0.388</b>
Social Wariness	-0.01	0.00	0.955	-0.143	0.135
Behavioral Inhibition x Social Wariness	0.03	0.03	0.742	-0.173	0.243
<b>Gender</b>	<b>-0.26</b>	<b>-0.24</b>	<b>0.001</b>	<b>-0.388</b>	<b>-0.102</b>

Note: Anxiety Month 1 and Anxiety Month 2 represent the first and second anxiety assessments during the COVID-19 pandemic, respectively. BI = Behavioral Inhibition; Gender is coded as 0 = Female Participants and 1 = Male Participants. Maternal Race/Ethnicity is coded as 1 = White and 0 = Other Race/Ethnicity.

#### 4) Examination of the study model with participants who have complete data on all measures.

**Rationale:** We fit the study's main model while including only participants who had complete data on all measures (listwise deletion).

**Results:** As shown in Table S5, the moderated mediation model conducted with participants who had complete data on all measures ( $n=92$ ) yielded the same pattern of results. Specifically, the interaction between BI and social wariness predicted adolescents' worry dysregulation, which in turn predicted elevated anxiety during the second assessment of the COVID-19 pandemic. Moreover, probing the interaction revealed the same pattern of results – such that higher toddlerhood BI predicted more worry dysregulation at 15 years at high levels of social wariness at 7 years (+1SD;  $b = 0.36, p < .001$ ), but not at low levels of social wariness (-1SD;  $b = 0.15, p = .080$ ). Finally, examining the conditional indirect effect also showed the same pattern of results such that individuals high in early BI, who continued to display high levels of social wariness during childhood, reported more worry dysregulation, which led to greater anxiety at Month 2 of the pandemic,  $b = 0.64, 95\%CI [0.166, 1.540]$ . This developmental pathway was not significant for children who displayed low levels of social wariness in childhood,  $b = 0.28, 95\%CI [-0.165, 0.884]$ .

**Conclusion:** As compared to the results in the main section of the paper, these results were similar, leading to the same conclusions. This suggests that procedures for handling missing data does not significantly impact the results. Importantly, these results only consider findings'

robustness, and we caution readers against interpreting these secondary findings. In the main text, we present results that follow current recommendations for handling missing data. This involves use of Full Information Maximum Likelihood and auxiliary variables associated with missing patterns.<sup>6</sup> Studies suggest that this approach reduces bias associated with missing data.<sup>7</sup> Moreover, listwise deletion leads to biases in the estimates and reduces power by not using partially complete data.<sup>8,9</sup> As such, we present and interpret the analyses using FIML in the main text.

Table S5. Path Analysis Results for Moderated Mediation Model Including Participants With Complete Data (Listwise Deletion).

<b>Predictors/Outcome</b>	<b><math>\beta</math></b>	<b><i>b</i></b>	<b><i>p</i></b>	<b>CI Lower</b>	<b>CI Upper</b>
<u>Anxiety Month 2</u>					
<b>Anxiety Month 1</b>	<b>0.82</b>	<b>0.73</b>	<b>0.000</b>	<b>0.634</b>	<b>0.836</b>
Behavioral Inhibition	-0.01	-0.06	0.921	-1.233	1.114
Maternal Education	-0.08	-0.55	0.135	-1.261	0.169
<b>Maternal Race/Ethnicity</b>	<b>0.16</b>	<b>1.70</b>	<b>0.003</b>	<b>0.584</b>	<b>2.816</b>
Gender	0.04	0.35	0.553	-0.803	1.501
Time between Assessments	0.06	0.04	0.378	-0.055	0.145
Age during COVID-19	0.08	0.60	0.161	-0.239	1.441
Date of Assessment	-0.11	-0.10	0.105	-0.222	0.021
<b>Worry Dysregulation</b>	<b>0.18</b>	<b>1.80</b>	<b>0.001</b>	<b>0.730</b>	<b>2.862</b>
<u>Worry Dysregulation</u>					
<b>Behavioral Inhibition</b>	<b>0.25</b>	<b>0.26</b>	<b>0.013</b>	<b>0.053</b>	<b>0.457</b>
Social Wariness	0.11	0.08	0.178	-0.035	0.187
<b>Behavioral Inhibition x Social Wariness</b>	<b>0.14</b>	<b>0.16</b>	<b>0.050</b>	<b>0.000</b>	<b>0.310</b>
<b>Gender</b>	<b>-0.23</b>	<b>-0.22</b>	<b>0.016</b>	<b>-0.405</b>	<b>-0.042</b>

Note: Anxiety Month 1 and Anxiety Month 2 represent the first and second anxiety assessments during the COVID-19 pandemic, respectively. Gender is coded as 0 = Female Participants and 1 = Male Participants. Maternal Race/Ethnicity is coded as 1 = White and 0 = Other Race/Ethnicity.

## References

1. Troller-Renfree S V., Buzzell GA, Bowers ME, et al. Development of inhibitory control during childhood and its relations to early temperament and later social anxiety: unique insights provided by latent growth modeling and signal detection theory. *J Child Psychol Psychiatry Allied Discip.* 2019;60(6):622-629.
2. Troller-Renfree S V, Buzzell GA, Pine DS, Henderson HA, Fox NA. Consequences of Not Planning Ahead: Reduced Proactive Control Moderates Longitudinal Relations Between Behavioral Inhibition and Anxiety. *J Am Acad Child Adolesc Psychiatry.* 2019;58(8):768-775.e1. [PubMed: 30768398]
3. Zeman JL, Cassano M, Suveg C, Shipman K. Initial validation of the children's worry management scale. *J Child Fam Stud.* 2010;19:381-392.
4. Zeman J, Shipman K, Penza-Clyve S. Development and initial validation of the children's sadness management scale. *J Nonverbal Behav.* 2001;25:187-205.
5. Zeman J, Shipman K, Suveg C. Anger and sadness regulation: predictions to internalizing and externalizing symptoms in children. *J Clin Child Adolesc Psychol.* 2002;31(3):393-398. [PubMed: 12149977]
6. Graham JW. Missing data analysis: making it work in the real world. *Annu Rev Psychol.* 2009;60:549-576. [PubMed: 18652544]
7. Enders C, Bandalos D. The Relative Performance of Full Information Maximum Likelihood Estimation for Missing Data in Structural Equation Models. *Struct Equ Model A Multidiscip J.* 2001;8(3):430-457.
8. Graham, J. W., Cumsille, P. E., & Shevock AE. Methods for handling missing data. In: *Handbook of Psychology.* 2nd ed. ; 2012.
9. Schafer JL, Graham JW. Missing data: our view of the state of the art. *Psychol Methods.* 2002;7(2):147-177. [PubMed: 12090408]