

COVID-19 stressors and symptoms of anxiety and depression in a community sample of children and adolescents

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Background: The COVID-19 public health crisis has created abrupt and unparalleled disruptions to the daily lives of children and adolescents across the world, placing them at significant risk for developing symptoms of anxiety and depression. **Method:** The current study used two data collection periods to determine which types of COVID-19-related stressors were associated with the greatest risk of anxiety and depression symptoms in a community sample of children and adolescents in the United States (U.S.) from May–August 2020 (T1) to February–April 2021 (T2). Seventy-nine youth (ages 10–17; $M = 13.41$, $SD = 2.10$; 54.4% female) completed a battery of online standardized questionnaires about COVID-19 stress and psychiatric symptoms at T1 and 56 of these also participated at T2. **Results:** The majority of children and adolescents reported experiencing the COVID-19-related stressors in multiple domains including daily routines, interpersonal relationships, education, finances, and health. A substantial proportion of the sample reported clinical levels of depression and anxiety symptoms at both T1 and T2. Multiple linear regression analyses revealed that, controlling for T1 anxiety and depression symptoms, T2 *interpersonal stressors* were significantly associated with elevated depression and anxiety scores at T2. **Conclusions:** The findings highlight the salience of social connection for children and adolescents, and may also underscore the risk associated with lockdown restrictions, social distancing, and school closures during the pandemic.

Key Practitioner Message

- Previous research has shown that the COVID-19 pandemic has generated significant levels of stress for children, adolescents, and families.
- The current study examined the types and frequency of COVID-19 stressors children and adolescents experienced, with the majority reporting multiple pandemic-related stressors.
- The findings from this study indicate a substantial proportion of children and adolescents reported clinically elevated levels of depression and anxiety symptoms.
- This study provides some of the first evidence that interpersonal stressors related to the COVID-19 pandemic are associated with symptoms of anxiety and depression in children and adolescents, controlling for prior levels of these symptoms.
- The current findings suggest that screening for levels of interpersonal stressors related to the COVID-19 pandemic may be important in identifying those children and adolescents who are at the greatest risk for developing symptoms of anxiety and depression.

Keywords: COVID-19; stress; depression; anxiety; children; adolescents

Introduction

As the COVID-19 pandemic continues through its second year, researchers have documented substantial mental health impacts on adults and college students across the globe (e.g., Coiro et al., 2021; Copeland et al., 2021). Children and adolescents may be particularly vulnerable to maladjustment in the context of COVID-19 because of the importance of schooling and social connections during this developmental period, which is characterized by an increased significance of

peer relationships (Guessoum et al., 2020) and an increased risk for the onset of many psychiatric disorders (Kessler et al., 2007).

Existing research across the world has provided initial evidence that the pandemic has had deleterious effects on child and adolescent mental health (e.g., Orgilés, Morales, Delvecchio, Mazzeschi, & Espada, 2020; Patrick et al., 2020). However, the vast majority of studies during the pandemic have been cross-sectional and the data were often collected in the earliest months of the pandemic (e.g., Jones, Mitra, & Bhuiyan, 2021). For

example, a recent meta-analysis included 29 published studies on child and adolescent depression and generalized anxiety symptoms found that in the early stages of the pandemic, the rates of clinically elevated symptoms were double the rates reported for children and adolescents prior to the pandemic (Racine et al., 2021). However, longitudinal studies have begun to emerge (e.g., Branje & Morris, 2021). For example, Magson et al. (2021) reported increases in depression and anxiety symptoms and decreases in life satisfaction among adolescents in Australia during the pandemic. Additional studies with multiple data waves have shown adolescents' symptoms began to recede as lockdown restrictions eased in the U.S. (Breux et al., 2021) and increased during subsequent periods of lockdown in the U.K. (e.g., Raw et al., 2021; Skripkauskaitė et al., 2021). Nevertheless, additional studies assessing the prevalence of mental health problems for children and adolescents at two or more time points during the pandemic are urgently needed to better understand the trajectory of symptoms overtime and whether these changes are predicted by environmental or individual difference, as this information may be imperative to informing clinical interventions.

Furthermore, the majority of previous studies assessing mental health symptoms in children and adolescents have been conducted outside of the U.S. (e.g., Racine et al., 2021). For example, a recent meta-analysis of studies from China indicated high rates of depression, anxiety, sleep disorders, and posttraumatic stress symptoms in children and adolescents, with a higher prevalence reported for adolescents and males as compared with younger children and females (Ma et al., 2021). Although research across the world has reported that children and adolescents are experiencing high levels of depression and anxiety as a result of the global pandemic, there is a need for an examination of the mental health of children and adolescents in the U.S.

Similar to research on mental health during the COVID-19 pandemic, research on the type, severity, and frequency of COVID-19-related stressors has focused primarily on adults or college students (Kujawa, Green, Compas, Dickey, & Pegg, 2020; Taylor et al., 2020) with limited research investigating the experiences of children and adolescents in the U.S. throughout the pandemic. However, the pandemic likely presents significant stressors for children and adolescents, as the majority of school districts across the U.S. transitioned to remote learning in the early months of the pandemic and social distancing became a primary mitigation strategy to reduce disease transmission (Olney, Smith, Sen, Thomas, & Unwin, 2021). Previous research has shown that higher symptom levels have been reported among children and adolescents who had a family member or friend infected with the virus (Duan et al., 2020), who self-reported challenges with online learning (Magson et al., 2021), and whose parents' employment was affected during the initial phase of the pandemic (Parolin & Lee, 2021). Given the developmental vulnerability of children and adolescents, it is imperative to systematically examine a wide range of COVID-19-related stressors in relation to youth mental health symptoms. Determining specific types of stressors that are salient among children and adolescents will help identify those at greatest need of intervention, as well as highlight

potential ways to reduce exposure to, and consequences of, stress (Buheji, Jahrami, & Dhahi, 2020).

The current study enrolled a community sample of children and adolescents in the U.S. at two time periods during the COVID-19 pandemic: May–August 2020 (T1) and February–April 2021 (T2). During T1, many states had begun to loosen restrictions, although infections and deaths began to rise again in summer 2020 (Bergquist, Otten, & Sarich, 2020). During T2, the U.S. was in the third wave of infections (Pei, Yamana, Kandula, Galanti, & Shaman, 2021). Many schools had returned to in-person learning with masking and social distancing requirements. Participants completed an online battery of questionnaires, and information was gathered on symptom levels of depression and anxiety and specific COVID-19-related stressors experienced. The first aim was to examine the types and frequency of the COVID-19 stressors experienced over two time periods. The second aim was to examine the levels of depression and anxiety symptoms. We hypothesized children and adolescents would report high levels of depression and anxiety symptoms using previously established clinical cut-offs on standardized measures. Lastly, we examined whether the stressors experienced by children and adolescents were associated with symptoms of anxiety and depression, and examined which types of stressors were most strongly associated with symptoms. We hypothesized a greater number of stressors would be associated with T2 depression and anxiety symptoms controlling for T1 symptoms.

Methods

Participants

Participants included 79 children and adolescents ages 10–17 years ($M = 13.41$, $SD = 2.10$; 54.4% female) at T1. The sample was diverse with respect to race (67.1% White, 17.7% Black or African American, 11.4% Multi-racial, 2.5% Asian, 1.3% Other). Of the 79 children and adolescents who participated in the study at T1, 56 provided complete data at T2 (70.9% of the sample). Children and adolescents who completed the T2 surveys were included in the present analyses (M age = 13.29; 55.4% female; 69.6% White), and on average they completed the follow-up surveys 8 months after T1 ($M = 8.79$, $SD = 1.00$). Participants who did not complete T2 did not significantly differ from those who completed T2 with regard to sex, race, age, T1 symptoms, or any of the COVID-19 stress scales with the exception of the stress regarding their own health at T1 [$t(75) = -2.21$, $p = .04$]. Specifically, children and adolescents who did not complete T2 reported more stressors at T1 about their own COVID-19 health.

Procedure

Participants were initially recruited between May and August 2020 from a variety of sources including local schools, social media, employee listservs from two participating universities in the U.S., and ResearchMatch, an online platform created by academic institutions to connect researchers with volunteer participants. Interested families completed an online interest form and were then contacted by research assistants via telephone or email to further explain the details of the study and ensure eligibility criteria were met. Inclusion criteria included the child or adolescent being ages 10–17, fluent in English, and living with their participating parent at least 50% of the time. After informed parental consent and child assent were obtained electronically, participants completed questionnaires through a secure online data-capturing website (REDCap). Participants were re-contacted by telephone and email in January 2021 and invited to complete the same battery of questionnaires.

Interested participants completed the surveys between February and April 2021. Participants received \$10 for the completion of surveys at each timepoint. All the procedures for this study were approved by the university Institutional Review Boards at both participating sites.

Measures

Demographics. Participants provided their demographic information including age, sex, and race.

Sources of COVID-19 Stress. The Pandemic Stress Questionnaire—Teen Version (PSQ) is a 22-item self-report measure of exposure to stressful events due to the COVID-19 pandemic and subjective severity of endorsed events. The teen version is adapted from the young adult version for ages 18–25 (Kujawa et al., 2020). For each item, participants selected “Yes” or “No” to indicate whether each event happened to them as a result of the COVID-19 pandemic. Endorsed events were rated on a 1 (not at all bad) to 5 (extremely bad) severity scale. The PSQ produces a total stressor score and six subscales including general life disruption, interpersonal, financial, educational goals, health-self, and health-others. One item (i.e., someone close to me died from COVID-19) is included in the interpersonal and health-others domains. The PSQ has been shown to have good convergent validity and reliability (Kujawa et al., 2020). The present analyses focused on the total number of endorsed stressors for the six subscales reported at T2.

Depression symptoms. The Center for Epidemiological Studies Depression—Child Version (CES-DC; Faulstich, Carey, Ruggiero, Enyart, & Gresham, 1986) is a 20-item self-report questionnaire that asks children and adolescents to rate how often over the past week they experienced symptoms associated with depression from 0 to 3 (0 = Rarely or none of the time to 3 = most or all of the time). Scores range from 0 to 60 with higher scores indicating greater depressive symptoms. A cutoff score of 15 or higher has been suggestive of depressive symptoms in children and adolescents (Weissman, Orvaschel, & Padian, 1980). Internal consistency for the sample was $\alpha = .89$ at T1 and $\alpha = .91$ at T2.

Anxiety symptoms. The Screen for Child Anxiety Related Disorders—Child Version (SCARED; Birmaher et al., 1999) is a 41-item self-report inventory that assesses childhood anxiety. Participants respond on a 3-point Likert scale (0 = Not True or Hardly Ever True to 2 = Very True or Often True). Guided by a recent meta-analysis (Racine et al., 2021), the present study focused on the generalized anxiety disorder (GAD) subscale which includes 9 of the 41 items. A score of 9 or above on this subscale may indicate the child meets criteria for GAD. Internal consistency for the sample was $\alpha = .94$ at T1 and $\alpha = .96$ at T2.

Data analytic approach

All the analyses were performed using SPSS (28th edition). Participants without complete data were excluded from the

analyses. Table 1 presents the means, standard deviations, and ranges for the variables of interest. All skewness and kurtosis statistics were in the acceptable range (Brown, 2006; George & Mallery, 2010). Table 2 presents the frequency of endorsed COVID-19 stressors by subscale at T1 and T2. Table 3 lists the bivariate Pearson's correlations using one-tailed tests among the variables of interest. Power analyses indicated that with $n = 56$, power = .80, and alpha = .05 one-tailed, significant correlations of medium effect sizes ($r = .22$) could be detected. Tables 4 and 5 present the multiple linear regressions predicting the residual scores in child and adolescent depression and anxiety symptoms at T2 from COVID-19 stressors reported at T2 by controlling for symptoms at T1 symptoms and covarying for child age and sex. The ΔR^2 is reported for each block in the model and is the indicator of the total effect of the predictors on the dependent variable included in that block.

Results

Descriptive statistics

The mean child and adolescent depression symptoms score was 15.16 at T1 and 15.71 at T2 with 41.1% of children and adolescents at T1 and 46.4% at T2 reporting clinically high levels of depressive symptoms. There was not a significant difference in reported depression symptoms from T1 and T2 [$t(55) = -.44, p = .66$]. T1 and T2 depressive symptoms were significantly correlated ($r = .57, p < .001$). The mean generalized anxiety symptoms score was 6.86 at T1 and 7.20 at T2 with 33.9% of children and adolescents at both T1 and T2 reporting clinically significant levels of symptoms. There was not a significant difference in reported anxiety symptoms from T1 to T2 [$t(55) = -.70, p = .49$]. T1 and T2 anxiety symptoms were significantly correlated ($r = .71, p < .001$). Males and females did not differ on their reports of depression symptoms at T1 or T2; however, differences in anxiety symptoms approached significance with females reporting greater symptoms at T1 [$t(54) = -1.74, p = .087$] and T2 [$t(54) = -1.87, p = .067$]. Child age was significantly correlated with symptoms of depression at T1 ($r = .31; p = .02$) and T2 ($r = .32; p = .02$) and anxiety symptoms at T2 ($r = .27; p = .045$). Therefore, child age and sex were included as covariates in the linear regression analyses.

COVID-19 stress exposure

Table 2 presents the frequencies of the stressors they experienced related to COVID-19 as of T1 and T2. The majority of children and adolescents reported experiencing general life disruption (>90%) and interpersonal stressors (>75%) at both timepoints. The most commonly endorsed stressors across all subscales were disruptions to travel plans, needing to cancel or postpone important events, and being unable to be with close family and friends. Although the financial, health of self, health of others, and educational stressors were less frequently endorsed, endorsement of these stressors was still noted. Among financial stressors, nearly one-fifth of children and adolescents reported that their parent lost their job or their work hours were significantly reduced as a result of COVID-19 at both timepoints. Regarding educational goals, 23.2% and 41.1% of children and adolescents at T1 and T2, respectively, reported having difficulty completing their schoolwork because of the pandemic. Regarding the health of self and health of others, by T2, nearly half of the children and adolescents had been tested for

Table 1. Descriptive statistics for key study variables

Variable	<i>M</i> (<i>SD</i>)	Range
T1 Depression	15.16 (8.96)	4–40
T2 Depression	15.71 (11.04)	1–48
T1 Anxiety	6.86 (4.62)	0–18
T2 Anxiety	7.20 (4.91)	0–18
T2 General Disruptions (4 items)	2.04 (1.03)	0–4
T2 Interpersonal (5 items)	1.55 (1.25)	0–5
T2 Financial (3 items)	.30 (.66)	0–3
T2 Educational Goals (2 items)	.57 (.74)	0–2
T2 Health Self (5 items)	.86 (.98)	0–4
T2 Health Others (4 items)	1.36 (1.14)	0–4
T2 Total (22 items)	6.57 (3.50)	0–14

T1 = Timepoint 1; T2 = Timepoint 2.

Table 2. The frequencies of COVID-19-related stressors at T1 and T2

PSQ Subscale	Timepoint	
	T1	T2
General Life Disruption	92.9%	91.1%
I had difficulty obtaining basic supplies because of the coronavirus pandemic (e.g., food, medicine, toilet paper).	17.9%	16.4%
I had to cancel travel or experienced a major disruption in travel plans because of the coronavirus pandemic.	76.8%	76.8%
I had to cancel or postpone other important events because of the coronavirus pandemic (e.g., events for a club, sporting events, major celebrations).	82.1%	76.4%
I had to take on additional responsibilities caring for others (e.g., siblings, other family members) due to the coronavirus pandemic.	26.8%	35.7%
Interpersonal	78.6%	76.8%
I was unexpectedly separated from family, friends, or others close to me because of the coronavirus pandemic (e.g., due to moves or travel restrictions).	41.1%	39.3%
I was unable to be with close family, friends, or partners because of the coronavirus pandemic.	66.1%	62.5%
I had conflicts or arguments with family members due to coronavirus (e.g., conflicts about living arrangements, shared work space, schedule expectations).	35.7%	35.7%
I experienced racism or discrimination due to the coronavirus pandemic.	5.4%	7.1%
Someone close to me died from COVID-19.	7.1%	10.9%
Financial	21.4%	21.4%
My family and I experienced significant financial strain due to the pandemic (e.g., due to travel, purchasing supplies, healthcare costs).	8.9%	12.5%
I temporarily or permanently lost a job or had my work hours greatly reduced due to the coronavirus pandemic.	1.8%	3.6%
My parent(s) temporarily or permanently lost a job or had their work hours greatly reduced because of the coronavirus pandemic.	14.3%	14.3%
Educational Goals	34.5%	42.9%
I had difficulty completing school work because of the coronavirus pandemic (e.g., not having a computer, no internet access or very slow connection).	23.2%	41.1%
I was unable to complete important requirements for my education due to the coronavirus pandemic (e.g., taking the SAT or other major tests).	16.1%	16.1%
Health (Self)	19.6%	55.4%
I had symptoms of COVID-19 (e.g., cough, fever, trouble breathing) but was unable to get tested.	5.4%	5.4%
I was tested for COVID-19.	0.0%	46.4%
I was diagnosed with COVID-19.	0.0%	1.8%
I had difficulty accessing or paying for physical or mental health care due to the coronavirus pandemic.	1.8%	3.6%
I was quarantined for 2 weeks or longer due to possible exposure to COVID-19 or due to international travel.	16.1%	28.6%
Health (Other)	30.4%	69.6%
Someone close to me had symptoms of COVID-19 (e.g., cough, fever, trouble breathing) but was unable to get tested.	10.7%	19.6%
Someone close to me was diagnosed with COVID-19.	12.5%	44.6%
Someone close to me was quarantined for 2 weeks or longer due to possible exposure to COVID-19 or due to international travel.	21.4%	61.8%
Someone close to me died from COVID-19.	7.1%	10.9%

Table 3. Bivariate Pearson correlations among key study variables

Variable	T1	T1	T2	T2
	Depression	Anxiety	Depression	Anxiety
T2 Total	.21 [†]	.21 [†]	.43**	.30**
T2 General Disruptions	.05	-.03	.12	-.01
T2 Interpersonal	.23*	.26*	.45**	.41**
T2 Financial	.26*	.25*	.21 [†]	.09
T2 Educational Goals	.12	.02	.12	.14
T2 Health Self	.09	.15	.26*	.24*
T2 Health Others	.02	.04	.31**	.12

T1 = Timepoint 1; T2 = Timepoint 2; [†]p < .10, *p < .05, **p < .01.

COVID-19 and knew someone close to them who was diagnosed.

Bivariate correlational analyses

Table 3 presents bivariate Pearson correlation coefficients among depression and anxiety symptoms at T1 and T2 and COVID-19 stressors at T2. In the test of the first hypothesis, the number of interpersonal and financial stressors experienced were significantly and positively correlated with T1 depression and anxiety symptoms. Total number of stressors experienced, interpersonal stressors, and health of self stressors were significantly and positively associated with T2 depression and anxiety symptoms. T2 depression symptoms were significantly and positively associated with health of

Table 4. Hierarchical linear regression analyses predicting T2 depression symptoms from T2 COVID-19 stressors

Block and predictor	<i>b</i> (<i>SE</i>)	β	<i>t</i>	<i>df</i>	<i>F</i>	Adjusted R^2	ΔR^2
Block 1				52	9.33***	.31	.32
T1 Depression	.64 (.15)	.52	4.40***				
Age	.80 (.63)	.15	1.28				
Sex	1.52 (2.47)	.07	.62				
Block 2				46	5.65***	.43	.18
T1 Depression	.54 (.14)	.44	3.91***				
Age	.92 (.58)	.17	1.59				
Sex	-.62 (2.46)	-.03	-.25				
T2 General Disruptions	-1.45 (1.33)	-.14	-1.09				
T2 Interpersonal	2.70 (1.10)	.31	2.47*				
T2 Financial	.04 (2.05)	.00	.02				
T2 Educational	-.48 (1.80)	-.03	-.27				
T2 Health Self	1.55 (1.23)	.14	1.26				
T2 Health Others	2.14 (1.13)	.22	1.89 [†]				

Male = 0, female = 1; T1 = Timepoint 1; T2 = Timepoint 2; [†] $p < .10$, * $p < .05$, *** $p < .001$.

Table 5. Hierarchical linear regression analyses predicting T2 anxiety symptoms from T2 COVID-19 stressors

Block and predictor	<i>b</i> (<i>SE</i>)	β	<i>t</i>	<i>df</i>	<i>F</i>	Adjusted R^2	ΔR^2
Block 1				52	19.60***	.50	.53
T1 Anxiety	.71 (.11)	.67	6.77***				
Age	.32 (.23)	.14	1.41				
Sex	.67 (.96)	.07	.70				
Block 2				46	9.20***	.57	.11
T1 Anxiety	.69 (.11)	.65	6.34***				
Age	.36 (.22)	.15	1.67				
Sex	-.29 (.98)	-.03	-.29				
T2 General Disruptions	-.85 (.52)	-.18	-1.64				
T2 Interpersonal	1.15 (.43)	.29	2.69*				
T2 Financial	-1.63 (.82)	-.22	-1.99 [†]				
T2 Educational	1.10 (.70)	.16	1.57				
T2 Health Self	.42 (.48)	.08	.88				
T2 Health Others	.17 (.44)	.04	.39				

Male = 0, female = 1; T1 = Timepoint 1; T2 = Timepoint 2; [†] $p < .10$, * $p < .05$, *** $p < .001$.

others stressors. Depression and anxiety symptoms were unrelated to general disruptions and educational goals.

Multiple linear regression analyses

Multiple linear regression analyses were conducted to test the hypothesis that greater COVID-19-related stressors would predict children's residual variance in depression and anxiety symptoms at T2, controlling for T1 symptoms, child sex, and age. Table 4 presents the linear regression analysis predicting T2 depression symptoms. Block 1 was significant such that T1 symptoms was a significant predictor of T2 symptoms; age and sex were not significant. In Block 2, we tested the main effects of COVID-19 stressors. The second block was significant with an additional 18% additional variance explained. T1 symptoms remained a significant predictor of T2 symptoms and T2 interpersonal stressors emerged as a significant predictor of residual variance in T2 symptoms controlling for T1 symptoms, such that greater reports of T2 interpersonal stress predicted greater depression symptoms at T2.

Table 5 presents the linear regression analysis predicting the anxiety symptoms of children and

adolescents at T2. Block 1 was significant such that T1 symptoms was a significant predictor of T2 symptoms; child age and sex were not significant. Block 2 was significant with an additional 11% of the variance explained by COVID-19 stressors. T1 symptoms remained a significant predictor of T2 symptoms and T2 interpersonal stressors emerged as a significant predictor of residual variance in symptoms at T2 controlling for T1 symptoms such that reports of greater T2 interpersonal stress predicted greater T2 anxiety symptoms.

Discussion

Regarding the first aim, the majority of children and adolescents reported experiencing multiple pandemic-related stressors. The stressors most commonly reported were interpersonal relationships and disruptions to daily routines. The majority of children and adolescents reported having to cancel or postpone travel plans and important events as well as being unable to be with close family and friends. Early in the pandemic (T1), few children and adolescents reported experiencing stressors related to their own health or the health of others;

however, by early 2021 (T2), the percentage rose to over half of the children and adolescents in the sample. Similarly, a greater number of children and adolescents reported experiencing difficulty completing their schoolwork later on in the pandemic than in its first few months. These results are consistent with findings from Mohler-Kuo, Dzemaili, Foster, Werlen, and Walitza (2021) in which the most commonly endorsed adolescent stressors involved disruptions in plans and reduced social interactions. However, this study was cross-sectional and did not report the timing of data collection during the pandemic.

Consistent with the second hypothesis, a substantial proportion of children and adolescents in this community sample reported clinically elevated levels of depression and anxiety symptoms, which is consistent with other research documenting high rates of mental health problems among youth during the COVID-19 pandemic across the globe (e.g., Racine et al., 2021). Specifically, nearly half of the sample reported depression symptoms above the clinical cut-off and one-third of the sample reported generalized anxiety symptoms above the clinical cut-off. These findings underscore the significant emotional toll of the pandemic on the mental health of children and adolescents, especially given this community sample does not represent a group who was at increased risk for developing emotional problems.

Surprisingly, symptoms of depression and anxiety did not significantly increase over time for the sample as a whole; several other longitudinal studies have reported increases in symptoms during the pandemic (e.g., Raw et al., 2021), although the specific timing of data collection varies. However, consistent with the third hypothesis, there was evidence that a greater number of COVID-19-related stressors was associated with a significant portion of the residual variance in depression and anxiety symptoms at T2 after controlling for T1 symptoms. More specifically, higher levels of *interpersonal* stressors, which includes being separated from close relationships, having conflicts and arguments, experiencing racism or discrimination, and having a loved one die from COVID-19, were associated with greater residual variance in anxiety and depression symptoms. This pattern reflects the salience of social connection for children and adolescents at this developmental stage, and may highlight the psychological risk associated with lockdown restrictions, social distancing, and school closures during the pandemic. These findings are consistent with extensive research on the role of social connectedness and isolation in mental and physical health (Holt-Lunstad, 2018).

Overall, the findings of the present study suggest that the pandemic mitigation strategies that are essential to reduce the spread of the virus, including social distancing, quarantines, and school closures, may also have unintended negative consequences on the mental health of children and adolescents. In line with these findings, Verlenden et al. (2021) found that children in the U.S. who were in virtual schooling or had combined instruction also experienced higher levels of emotional distress based on parent report than children who had in-person instruction during the pandemic. However, Oosterhoff, Palmer, Wilson, and Shook (2020) reported that adolescents' specific motivations for socially distancing are important to consider, as they were differentially associated with mental health symptoms. For example,

adolescents who reported socially distancing for personal health reasons reported greater anxiety symptoms while those who socially distanced because of recommendations from friends reported greater depression symptoms. These findings suggest it is important for policymakers to consider the psychosocial risk associated with a physical distancing from peers and close relationships, which has been so critical in reducing transmission. It will be important for parents, educators, and medical providers to identify and monitor children and adolescents who are socially isolated, understand their motivations for distancing, and screen for depression and anxiety symptoms.

The present study had several limitations. The sample size was relatively small with relatively high attrition, which may limit the generalizability of the findings. Pre-pandemic data on the mental health of the sample was not available, and so it is not clear the extent to which the pandemic contributed to or caused these elevated psychiatric symptoms. Our opt-in recruitment strategy may have biased our sample to not be entirely representative. Educational and financial stressors may have been under-sampled, as the PSQ contains only two and three items, respectively. Our analyses focused on the occurrence of stressors rather than the perceived severity. This approach is more statistically conservative and avoids potential confounds between perceived stress and distress (Harkness & Monroe, 2016), although the magnitude of the effects may have been larger with the perceived severity scores. These limitations were offset in part by several strengths, including two data collection periods, the use of standardized questionnaires with established clinical cutoffs to assess the constructs of interest, self-reports from children and adolescents in the sample, and data from a community sample in the U.S.

The findings have important implications for future research. First, given the widespread availability of telecommunication technology (e.g., Zoom) and the popularity of social media, it will be important to understand whether these provide an effective alternative to in-person social interactions and mitigate risk to youth mental health. This may be particularly important to examine based on an emerging body of evidence that social media may be detrimental to the well-being of children and adolescents (e.g., Vannucci & McCauley Ohannessian, 2019). Second, future research should explore potential moderators of the association between pandemic-related stress and psychiatric symptoms, such as perceived social support, coping skills, and parenting behaviors, as an understanding of protective factors may inform clinical interventions. At last, continued longitudinal research on the possible long-term mental health consequences of the pandemic in childhood and adolescence is needed.

Acknowledgements

This research was supported by a gift from Patricia and Rodes Hart and grant T32-MH18921 from the National Institute of Mental Health. Responsibility for the final version of the work submitted and published, including study conceptualization, data collection, data analyses, and writing: all authors. Full access to all data in the study, responsibility for the integrity of the data in the study, and the accuracy of the data analyses:

Watson, Coiro, & Compas. The authors are grateful to the children and adolescents who participated in the study and shared their experiences. The authors have declared that they have no competing or potential conflicts of interest.

Ethical information

The questionnaires and methodology for this study were approved by the Institutional Review Boards at both universities (Vanderbilt University IRB #200774; Loyola University Maryland IRB Log Number: HS-2020-052). Written informed consent was obtained from all parents and assent was obtained from all children and adolescents.

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References

- Bergquist, S., Otten, T., & Sarich, N. (2020). COVID-19 pandemic in the United States. *Health Policy and Technology, 9*, 623–638.
- Birmaher, B., Brent, D.A., Chiappetta, L., Bridge, J., Monga, S., & Baugher, M. (1999). Psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED): A replication study. *Journal of the American Academy of Child & Adolescent Psychiatry, 38*, 1230–1236.
- Branje, S., & Morris, A.S. (2021). The impact of the COVID-19 pandemic on adolescent emotional, social, and academic adjustment. *Journal of research on adolescence: The official journal of the Society for Research on Adolescence, 31*(3), 486–499. <https://doi.org/10.1111/jora.12668>
- Breaux, R., Dvorsky, M.R., Marsh, N.P., Green, C.D., Cash, A.R., Shroff, D.M., ... & Becker, S.P. (2021). Prospective impact of COVID-19 on mental health functioning in adolescents with and without ADHD: Protective role of emotion regulation abilities. *Journal of Child Psychology and Psychiatry, 62*, 1132–1139.
- Brown, T.A. (2006). *Confirmatory factor analysis for applied research*. New York: Guilford Press.
- Buheji, M., Jahrami, H., & Dhahi, A.S. (2020). Minimising stress exposure during pandemics similar to COVID-19. *International Journal of Psychology and Behavioral Sciences, 10*, 9–16.
- Coiro, M.J., Watson, K.H., Ciriegio, A., Jones, M., Wolfson, A.R., Reisman, J., & Compas, B.E. (2021). Coping with COVID-19 stress: Associations with depression and anxiety in a diverse sample of U.S. adults. *Current Psychology, 1–13*. <https://doi.org/10.1007/s12144-021-02444-6>
- Copeland, W.E., McGinnis, E., Bai, Y., Adams, Z., Nardone, H., Devadanam, V., ... & Hudziak, J.J. (2021). Impact of COVID-19 pandemic on college student mental health and wellness. *Journal of the American Academy of Child and Adolescent Psychiatry, 60*, 134–141.
- Duan, L., Shao, X., Wang, Y., Huang, Y., Miao, J., Yang, X., & Zhu, G. (2020). An investigation of mental health status of children and adolescents in China during the outbreak of COVID-19. *Journal of Affective Disorders, 275*, 112–118.
- Faulstich, M.E., Carey, M.P., Ruggiero, L., Enyart, P., & Gresham, F. (1986). Assessment of depression in childhood and adolescence: An evaluation of the Center for Epidemiological Studies Depression Scale for Children (CES-DC). *The American Journal of Psychiatry, 143*, 1024–1027.
- George, D., & Mallery, M. (2010). *SPSS for Windows step by step: A simple guide and reference, 17.0 update* (10a edn). Boston: Pearson.
- Guessoum, S.B., Lachal, J., Radjack, R., Carretier, E., Minasian, S., Benoit, L., & Moro, M.R. (2020). Adolescent psychiatric disorders during the COVID-19 pandemic and lockdown. *Psychiatry Research, 291*, 113264.
- Harkness, K.L., & Monroe, S.M. (2016). The assessment and measurement of adult life stress: Basic premises, operational principles, and design requirements. *Journal of Abnormal Psychology, 125*, 727–745.
- Holt-Lunstad, J. (2018). Why social relationships are important for physical health: A systems approach to understanding and modifying risk and protection. *Annual Review of Psychology, 69*, 437–458.
- Jones, E., Mitra, A.K., & Bhuiyan, A.R. (2021). Impact of COVID-19 on mental health in adolescents: A systematic review. *International Journal of Environmental Research and Public Health, 18*, 2470.
- Kessler, R.C., Amminger, G.P., Aguilar-Gaxiola, S., Alonso, J., Lee, S., & Ustün, T.B. (2007). Age of onset of mental disorders: A review of recent literature. *Current Opinion in Psychiatry, 20*, 359–364.
- Kujawa, A., Green, H., Compas, B.E., Dickey, L., & Pegg, S. (2020). Exposure to COVID-19 pandemic stress: Associations with depression and anxiety in emerging adults in the United States. *Depression and Anxiety, 37*, 1280–1288.
- Ma, L., Mazidi, M., Li, K., Li, Y., Chen, S., Kirwan, R., ... & Wang, Y. (2021). Prevalence of mental health problems among children and adolescents during the COVID-19 pandemic: A systematic review and meta-analysis. *Journal of Affective Disorders, 293*, 78–89.
- Magson, N.R., Freeman, J., Rapee, R.M., Richardson, C.E., Oar, E.L., & Fardouly, J. (2021). Risk and protective factors for prospective changes in adolescent mental health during the COVID-19 pandemic. *Journal of Youth and Adolescence, 50*, 44–57.
- Mohler-Kuo, M., Dzemaili, S., Foster, S., Werlen, L., & Walitza, S. (2021). Stress and mental health among children/adolescents, their parents, and young adults during the first COVID-19 lockdown in Switzerland. *International Journal of Environmental Research and Public Health, 18*, 4668.
- Olney, A.M., Smith, J., Sen, S., Thomas, F., & Unwin, H.J.T. (2021). Estimating the effect of social distancing interventions on COVID-19 in the United States. *American Journal of Epidemiology, 190*, 1504–1509.
- Oosterhoff, B., Palmer, C.A., Wilson, J., & Shook, N. (2020). Adolescents' motivations to engage in social distancing during the COVID-19 pandemic: Associations with mental and social health. *The Journal of Adolescent Health, 67*, 179–185.
- Orgilés, M., Morales, A., Delvecchio, E., Mazzeschi, C., & Espada, J.P. (2020). Immediate psychological effects of the COVID-19 quarantine in youth from Italy and Spain. *Frontiers in Psychology, 11*, 579038.
- Parolin, Z., & Lee, E.K. (2021). Large socio-economic, geographic and demographic disparities exist in exposure to school closures. *Nature Human Behavior, 5*, 522–528.
- Patrick, S.W., Henkhaus, L.E., Zickafosse, J.S., Lovell, K., Halvorson, A., Loch, S., ... & Davis, M.M. (2020). Well-being of parents and children during the COVID-19 pandemic: A national survey. *Pediatrics, 146*, e2020016824. <https://doi.org/10.1542/peds.2020-016824>
- Pei, S., Yamana, T.K., Kandula, S., Galanti, M., & Shaman, J. (2021). Burden and characteristics of COVID-19 in the United States during 2020. *Nature, 598*, 338–341.
- Racine, N., McArthur, B.A., Cooke, J.E., Eirich, R., Zhu, J., & Madigan, S. (2021). Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19: A meta-analysis. *JAMA Pediatrics, 175*, 1142–1150.
- Raw, J., Waite, P., Pearcey, S., Shumn, A., Patalay, P., & Creswell, C. (2021). Examining changes in parent-reported child and adolescent mental health throughout UK's first COVID-19 national lockdown. *Journal of Child Psychology and Psychiatry, 62*, 1391–1401.
- Skripkauskaitė, S., Shum, A., Pearcey, S., McCall, A., Waite, P., & Creswell, C. (2021). *Changes in children's mental health symptoms from March 2020 to June 2021 (Report 11)*. CoSPACE Study.
- Taylor, S., Landry, C.A., Paluszczek, M.M., Fergus, T.A., McKay, D., & Asmundson, G. (2020). Development and initial

- validation of the COVID stress scales. *Journal of Anxiety Disorders*, 72, 102232.
- Vannucci, A., & McCauley Ohannessian, C. (2019). Social media use subgroups differentially predict psychosocial well-being during early adolescence. *Journal of Youth and Adolescence*, 48, 1469–1493.
- Verlenden, J.V., Pampati, S., Raspberry, C.N., Liddon, N., Hertz, M., Kilmer, G., ... & Ethier, K.A. (2021). Associations of children's mode of school instruction with child and parent experiences and well-being during the COVID-19 pandemic – COVID experiences survey, United States, October 8–November 13, 2020. *Morbidity and Mortality Weekly Report*, 70, 369–376.
- Weissman, M.M., Orvaschel, H., & Padian, N. (1980). Children's symptom and social functioning self-report scales: Comparison of mothers' and children's reports. *Journal of Nervous and Mental Disorders*, 168, 736–740.

Accepted for publication: 1 August 2022