Prospective Examination of Psychological Trauma among Adolescents during the COVID-19 Pandemic

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Abstract

Objective: This longitudinal study investigated the predictors of and changes in psychological trauma during the COVID-19 pandemic.

Method: Participants included 236 adolescents (130 males; Mage = 16.74 years in spring 2020; 49.6% diagnosed with attention-deficit hyperactivity disorder; 16.1% diagnosed with an anxiety or depressive disorder) in the United States who completed online questionnaires at four timepoints (spring 2020, summer 2020, fall 2020, spring 2021).

Results: Repeated measures ANOVA showed that psychological trauma was highest during stay-at-home orders in spring 2020, and decreased for a majority of adolescents by the summer of 2020. However, ~20% of adolescents exhibited moderate-to-clinical levels of psychological trauma at each timepoint. Four groups were identified based on the presence of psychological trauma symptoms: 1) *resilient group* (normal range across all timepoints; 60.6%), 2) *moderate fluctuating group* (moderate range at one or more timepoints; 18.2%), 3) *severe fluctuating group* (clinical range at one or more timepoints; 14.0%), and 4) *chronic psychological trauma group* (moderate or clinical range across all timepoints; 7.2%). Females, adolescents with pre-existing internalizing disorders, and participants whose families were most impacted by the pandemic were more susceptible to experiencing psychological trauma symptoms.

Conclusions: Findings highlight at-risk populations and suggest that the COVID-19 pandemic resulted in psychological trauma symptoms for approximately 20% of adolescents at some point during the first year of the pandemic. There is critical need to provide mental health services to adolescents, such as through school-based services, to reduce the negative long-term psychological impact of the pandemic.

Clinical Impact Statement: Female adolescents, those with pre-existing internalizing disorders, and those whose families were most impacted by the pandemic are most vulnerable for displaying psychological trauma symptoms during the COVID-19 pandemic. Despite decreases in symptoms on average from spring 2020 to spring 2021, approximately 20% of adolescents experienced moderate-to-clinical psychological trauma symptoms at some point in 2020-2021. Addressing this substantial mental health need during the ongoing pandemic, such as through school-based services is critical.

The COVID-19 pandemic caused a major shift in every facet of life for adolescents across the world. In person interactions with teachers/peers and extracurricular activities were paused for students in the United States beginning in March 2020 (Moreland et al., 2020). Many students continued to experience remote learning and/or multiple changes in learning format during the 2020-2021 school year (Becker et al., 2020; Lischer et al., 2021). Along with these disruptions, the pandemic has the clear potential to be a chronic stressor for many adolescents given the ongoing threat of COVID-19 exposure for themselves or loved ones, and the numerous emotional, mental, and financial stressors brought on by the pandemic. Chronic stress or trauma early in life has been linked to psychiatric morbidity such as post-traumatic stress disorder (PTSD) and depression over the lifespan (Heim et al., 2008; Pervanidou et al., 2020). Adolescents are especially vulnerable to chronic stressors because the brain structures that mediate the stress response (e.g., pituitary gland, hippocampus, amygdala, prefrontal cortex) are still maturing during this developmental period (Romeo, 2013). Additionally, the adolescent brain is more sensitive to glucocorticoids (e.g., cortisol), and the duration and amount of glucocorticoids released during times of stress for adolescents is increased (Romeo, 2013). There is currently a gap in the literature on the long-term psychological traumatic impact that a continuous stressor like the COVID-19 pandemic could have on adolescents, especially those with pre-existing psychiatric disorders. As such, the present study sought to examine changes in psychological trauma symptoms in adolescents in the United States during the COVID-19 pandemic across four timepoints: spring 2020, summer 2020, fall 2020, and spring 2021. Additionally, it examined factors (pre-COVID-19 mental health diagnoses, biological sex, and COVID-19 impact) that may predict higher levels of psychological trauma symptoms.

Psychological Trauma Following Chronic Stress

Trauma exposure (i.e., a Criterion A event that involves actual or threatened death, serious injury, or sexual violence) is a required risk factor for the diagnosis of PTSD, but it is not sufficient because not all who are exposed to trauma develop PTSD. In addition, even individuals that may not meet the diagnostic criteria according to the Diagnostic and Statistical Manual, Fifth Edition (DSM-5; American Psychiatric Association, 2013), may still be suffering from chronic traumatic stress and significant life impairment (Williamson et al., 2014). Due to the nature of the pandemic, many individuals might experience significant distress characteristic of psychological trauma yet not fit PTSD diagnostic criteria. For example, diagnostic criteria for PTSD excludes trauma exposure through social media, television, or movies, and the diagnosis focuses on the stress reactions from past, not future events. However, studies have shown that the daily reminders of the infection and death rate through media outlets was stressful for some adolescents (Zhao et al., 2020) and adults (Bridgland et al., 2021). For example, Bridgland et al. (2021) found that adults exhibited "PTSD-like symptoms" for events they anticipated would happen, regardless of if they were directly exposed to COVID-19 or indirectly exposed through the media.

Prior research during other traumatic events and chronic stressors have shown the short- and long-term impact of natural disasters (e.g., hurricane, earthquake, wild fire; Cenat et al., 2015; Jin et al., 2019; Orengo-Aguayo et al., 2019), school shootings (e.g., Miron et al., 2014; Travers et al., 2018), and other disasters (e.g., Yule et al., 2000) on the mental health of adolescents. Specifically, some psychological trauma symptoms may not appear immediately but appear sometime after traumatic exposure. For example, among adolescent survivors of the Wenchuan earthquake in China, it was discovered that the prevalence rate for PTSD (23.3%) was the highest one year after the traumatic event, although there were five distinct patterns of

change in PTSD symptoms following the earthquake (Fan et al., 2015). These findings highlight the need to examine the various patterns of psychological trauma symptoms that adolescents could experience after a traumatic event or chronic stressor. We might expect for there to be similar differential patterns of change in psychological trauma symptoms during the COVID-19 pandemic, as some might have been initially impacted by stay-at-home orders and the initial shock of the pandemic, but then improved as summer and the return to school in fall 2020 occurred, whereas others might have a more latent reaction as the pandemic continues. Others might show early symptoms that remain high throughout the chronic stressor; and still others might experience low levels of symptoms throughout. Such patterns of response for psychological trauma have yet to be explored during the COVID-19 pandemic.

Potential Predictors for Risk of Psychological Trauma

Many individual factors, including demographic factors (e.g., biological sex), clinical factors such as the presence of an internalizing disorder (e.g., anxiety, depression) or attention-deficit/hyperactivity disorder (ADHD), and the impact of the trauma (e.g., duration, proximity, severity) have been previously identified as predictors of psychological trauma development following traumatic events. Regarding sex, females develop PTSD at a higher rate than males even when trauma type is controlled for (e.g., Garza et al., 2017, Tolin et al., 2008) and score higher on re-experiencing, avoidance, and arousal subscales of PTSD (Ditlevsen et al., 2010). Internalizing disorders contribute to the pre-traumatic risk for PTSD in females, since these disorders are more prevalent in females than males post-puberty (e.g., Christiansen et al., 2015). Regarding clinical diagnoses, numerous studies have shown that internalizing symptoms are a predictor of increased risk for the development of PTSD after traumatic exposure (e.g., Perkonigg et al., 2000; Storr et al., 2007). For example, a retrospective study investigating PTSD

in young adults found that those with pre-existing major depression had a threefold increased risk of developing PTSD after trauma exposure (Breslau et al., 2000). Similarly, in a longitudinal study with 166 trauma-exposed adolescents, Haller et al. (2012) found higher levels of internalizing symptoms predicted development of PTSD, especially if coupled with family adversity. Externalizing disorders such as ADHD have also been linked to increased risk for PTSD. Specifically, individuals with ADHD (a neurodevelopmental disorder characterized by high rates of inattention, impulsivity, and/or hyperactivity) are at higher risk for exposure to psychological trauma (Ford et al., 2009). Additionally, childhood ADHD has been found to significantly increase risk for PTSD in adulthood (e.g., Adler et al., 2004; Biederman et al., 2013). Importantly, this elevated risk for PTSD among individuals with ADHD does not appear to merely be individuals with PTSD being mislabeled as having externalizing problems (e.g., Szymanski et al., 2011). Finally, proximity to a traumatic event or chronic stressor is a risk factor for developing PTSD. Direct exposure is strongly associated with PTSD (e.g., Elklit et al., 2008; May et al., 2016). Indirect exposure such as learning about an unexpected death of a close family member or friend can also causes psychological trauma symptoms. For example, a study examining posttraumatic stress in students after the Virginia Tech campus shooting in 2007 found that uncertainty about the safety of a close friend/acquaintance was associated with one of the highest levels of posttraumatic stress symptoms (Hughes et al., 2011). This highlights that psychological trauma symptoms can occur through both direct and indirect exposure to a traumatic event.

COVID-19 and Psychological Trauma Symptoms

Little is known about the short and long-term effects of a chronic stressor, such as the COVID-19 pandemic, with only one study to date examining such impacts prior to COVID-19.

Specifically, Sprang et al. (2013) examined the effect of isolation and quarantine on the mental health of children and their parents from previous pandemics such as the influenza A (H1N1) and the severe acute respiratory syndrome (SARS). They found that parents and children that had to either isolate or quarantine during these pandemics were at increased risk to either screen as at risk for PTSD or to meet the diagnostic criteria for PTSD (Sprang et al., 2013). Specifically, 28% of parents that experienced isolation or quarantine met the diagnostic criteria for PTSD compared to 5.8% of parents who did not experience social distancing. Furthermore, 30% of the children who had experienced isolation or quarantine met the diagnostic criteria for PTSD, compared to 1.1% of children who were not isolated/quarantined (Sprang et al., 2013).

Early research on the psychological impact of the COVID-19 pandemic has shown that adolescents are experiencing higher levels of psychological distress than pre-COVID (Qiu et al., 2020). For example, a survey given to 8,079 Chinese adolescents found that 43% experienced symptoms of depression and 37% experienced anxiety symptoms (Zhou et al., 2020). However, when examining psychological trauma symptoms specifically, research during COVID-19 has almost exclusively focused on adults, particularly health care workers (e.g., Blekas et al., 2020; Johnson et al., 2020). To date, only a handful of cross-sectional studies have examined psychological trauma symptoms during the COVID-19 pandemic among adolescents (Hu et al., 2021; Li et al., 2020; Liang et al., 2020; Murata et al., 2021; Yue et al, 2020). In the studies conducted in China in January-March 2020, rates of severe psychological trauma symptoms or meeting criteria for PTSD ranged considerably (3.5-12.1%). Murata and colleagues (2021) found that adolescents in the United States were significantly more likely to display moderate to severe psychological trauma symptoms (45%) relative to adults (33%) during spring/summer 2020. There has been limited research examining predictors of trauma-related distress during the

pandemic; however, one study suggests that positive coping is a protective factor and negative coping is a risk factor for trauma-related distress in adolescents (Zhang et al., 2020). Despite this solid foundation of evidence for the significant impact COVID-19 has had on adolescent psychological trauma symptoms, we are unaware of any study that has used a prospective longitudinal design to examine psychological trauma symptoms at multiple timepoints during the pandemic in the United States.

Given this backdrop, this study sought to fill this gap in the literature by examining the psychological trauma symptoms of adolescents in the United States, and factors that contributed to such symptoms throughout a year of the COVID-19 pandemic (i.e., from stay-at-home orders in spring 2020 to spring 2021 once widespread vaccination had begun). Our sample is uniquely suited to examine risk for psychological trauma symptoms, as the sample was recruited pre-COVID-19 with approximately half of the adolescents being comprehensively diagnosed with mental health disorders. Unlike many other traumas the onset of psychological trauma for COVID-19 is unclear and may affect individuals differently at different times. This paper represents a unique and important study assessing change in and predictors of psychological trauma symptoms over four COVID-19 timepoints. Based on prior longitudinal COVID-19 mental health research (e.g., Breaux et al., 2021), it was hypothesized that rates of psychological trauma symptoms would be highest during spring 2020 stay-at-home orders, with decreases observed on average from spring 2020 to spring 2021. It was further hypothesized that a small but meaningful proportion of adolescents would continue to display moderate or severe psychological trauma symptoms during summer 2020 through spring 2021. Finally, it was predicted that females, adolescents with ADHD or an internalizing disorder, and adolescents whose families were most impacted by the pandemic, would display the highest rates of

psychological trauma symptoms throughout the COVID-19 pandemic.

Method

Participants and Procedures

Participants were 236 adolescents (130 males; 15–17 years, $M = 16.74$, $SD = 0.60$ in spring 2020) who were initially recruited from local middle schools around two sites in the Southeastern and Midwestern United States (a university and an academic medical center). Approximately half of the sample ($n = 117$) was specifically recruited to represent adolescents diagnosed prior to COVID-19 with ADHD. Almost a third of adolescents (30.2%; 8.4% of adolescents without ADHD; 52.6% of adolescents with ADHD) were receiving school-based services through an Individualized Education Program or 504 Plan prior to COVID-19. Additionally, 38 participants were comprehensively diagnosed with an anxiety or depressive disorder prior to COVID-19. Adolescents identified as predominantly White (80.5%), with 9.7% identifying as biracial/multiracial, 5.5% identifying as Black, 4.2% Asian; 5.5% of the sample identified as Hispanic/Latinx. Participants came from a range of socioeconomic backgrounds (M family income=$95,000, SD= $33,766), with 23% of families falling below the 2019 median household income ($68,703; United States Census Bureau, 2020). Participants who provided consent to be contacted in the future (visits between September 2018-February 2020; $N = 262$) were invited to participate in the current study, with COVID-19 data being collected over four timepoints: spring 2020 (May-June, 2020; 3.8% missing adolescent data), summer 2020 (July-August, 2020; 0.8% missing adolescent data), fall 2020 (October–November, 2020; 11.4% missing adolescent data), and spring 2021 (March-May, 2021; 22.0% missing adolescent data). Details of the larger study's diagnostic and study procedures can be found elsewhere (Becker et al., 2019) and in the online supplemental materials. Study procedures were approved by the

Virginia Commonwealth University and Cincinnati Children's Hospital Medical Center

Institutional Review Boards.

Measures

Child and Adolescent Trauma Screen (CATS; Sachser et al., 2017)

The CATS is a 20-item self-report questionnaire on a 4-point scale (0 = *never* to 3 =

almost always) that screens for psychological trauma symptoms in youth ages 7-17 years. The

questionnaire assesses each of the five DSM-5 PTSD symptom clusters: re-experiencing,

avoidance, negative mood/cognition, arousal, and functional impairment. The CATS used in this

study was modified to assess posttraumatic stress symptoms specifically resulting from the

COVID-19 pandemic (e.g., "Upsetting thoughts or pictures about the COVID-19 pandemic that

pop into your head.") for nine of the items; the remaining 11 items were general psychological

trauma symptoms (e.g., "Trouble falling or staying asleep."). The CATS has been shown to have

good reliability αs = 0.88 to 0.94, and strong convergent validity (rs = 0.62-0.82; Sachser et al.,

2017). Reliability was very good across all four time points in the present dataset: αs = 0.92-

0.93. The total symptom score was calculated by summing up the 20 items (range = 0-60). A cut-

off $\geq$ 21 is indicative of a clinically relevant level of psychological trauma symptoms, whereas

values between 15 and 20 are considered moderate psychological trauma symptoms, and values

<15 are not clinically elevated.

Pre-COVID Mental Health Diagnoses

The ADHD group consisted of any adolescents who met DSM-5 criteria for ADHD

combined or predominantly inattentive presentation pre-COVID-19. The Internalizing Disorder

group consisted of any adolescents who met criteria for any anxiety or depressive disorder (e.g.,

generalized anxiety, major depression, persistent depressive disorder) pre-COVID-19 based on

parent or adolescent report on the Children's Interview for Psychiatric Syndromes (ChIPS; Weller et al., 2000). The ChIPS is a highly structured interview designed for use by trained lay interviewers, which was validated in inpatient, outpatient, and community-based samples (Weller et al., 2000). Diagnoses were provided first by the study staff (e.g., doctoral student, postdoctoral fellow) administering the ChIPS, and then discussed with a Ph.D. level clinician prior to determining final diagnoses.

Epidemic-Pandemic Impacts Inventory (EPII; Grasso et al., 2020)

The EPII consists of 92 parent-report yes/no items that assess the impact of COVID-19 on members of a family's personal, professional, and social life. The measure asks questions about changes in employment, education, home life, health, and social activities since the pandemic (e.g., "Laid off from job or had to close own business", "Had a child home who could not go to school", "Separated from family and close friends"). Items 1-49 of the questionnaire were used to calculate the total impact score for this study, which covered topics on education, home life, work, employment, social activities, economics, emotional health, and well-being. Of note, two items were not endorsed by any participants (i.e., 21. Became homeless, 38. Unable to access clean water), as such this variable includes 47 items. Reliability as measured by Kuder-Richardson-20 (KR-20 = .86) value was acceptable for this measure in the current study.

Analytic Plan

Descriptive statistics and bivariate correlations were first examined. A repeated measures ANOVA with follow-up comparison tests was run to examine linear and quadratic change in psychological trauma symptoms from spring 2020 to spring 2021. Next, we examined the percentage of adolescents who fell into the moderate and clinical psychological trauma ranges at each timepoint. Finally, sub-groups were created to reflect patterns of change in psychological

trauma symptoms throughout the pandemic. Chi-square tests were then run to examine whether

biological sex, ADHD diagnostic status, and internalizing disorder diagnostic status differed

across the identified sub-groups, and a one-way ANOVA was run to examine whether COVID-

19 impact difference across the identified groups. All analyses were run in SPSS version 26.

Results

Descriptive statistics and correlations for study variables are presented in Table 1.

Females were less likely to be diagnosed with ADHD but had higher levels of internalizing

disorders and psychological trauma. Adolescents with internalizing disorders had higher levels of

psychological trauma symptoms during the summer and fall 2020 timepoints. Parents of

adolescents with ADHD reported being more impacted by COVID-19. Furthermore, parents

reporting higher levels of COVID-19 impact had adolescents with greater psychological trauma

at two timepoints (spring and fall 2020). Finally, strong correlations were found between

psychological trauma symptoms at all four timepoints.

Change in Psychological Trauma from Spring 2020 to Spring 2021

The repeated measure ANOVA revealed that on average, psychological trauma

symptoms displayed significant linear and quadratic change from spring 2020 to spring 2021, F

$= 6.11$ and 14.48, $p = .014$ and $p < .001$, respectively[1]. Specifically, psychological trauma

symptoms were significantly higher in spring 2020 than summer 2020, $t = 4.12$, $p < .001$, fall

2020, $t = 4.18$, $p < .001$, and spring 2021, $t = 2.69$, $p = .008$ (see Figure 1a). In contrast,

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[1] Given that participants with an ADHD ($\chi2 = 8.26$, $p = .004$) or internalizing ($\chi2 = 5.50$, $p = .019$) disorder were less likely to have CATS data at all four time points and that repeated measures ANOVA uses listwise deletion, these analyses were re-run using multiple imputation with ten imputed datasets. Participants with vs. without complete CATS data did not differ on demographic factors (sex, family income, race/ethnicity). Similar pooled means across the 10 datasets relative to the original dataset (see Table 1) were observed at each of the four timepoints (spring 2020: 10.01, summer 2020: 7.62, fall 2020: 7.66, spring 2021: 7.82).The same pattern of significant linear and quadratic change was observed across all 10 estimated datasets, all ps < .004, with spring 2020 having significantly higher psychological trauma symptoms than the other three timepoints ps < .002, and the summer 2020, fall 2020, and spring 2021 timepoints not significantly differing from each other, $p =.712-.914$.

symptoms in summer 2020, fall 2020, and spring 2021 did not significantly differ, ts = -0.35 -

0.40, ps > .688. Examination of rates of moderate and clinical levels of psychological trauma

symptoms revealed a slightly different pattern than the continuous repeated measures ANOVA

analysis (see Table 2). Specifically, 25.1% of adolescents displayed moderate to clinical

psychological trauma symptoms during spring 2020. There were significant drops in rates of

clinical psychological trauma from spring to summer 2020 (13.2 to 8.5%), p = .050 (resulting in

17% in the moderate to clinical range). Although rates of clinical psychological trauma

continued to drop in fall 2020 (7.2%) and spring 2021 (7.0%) this was not a significant change

(ps > .197). Rates of moderate psychological trauma symptoms displayed a non-significant

increase from summer to fall 2020 (8.5% to 11.5%), and again from fall 2020 to spring 2021

(11.5% to 12.4%), ps > .224. As such, approximately 20% of adolescents remained in the

moderate to clinical psychological trauma range during the 2020-2021 school year.

To better understand individual variation in psychological trauma symptoms, five groups

were created based on patterns of change observed in these categorical classifications across the

four timepoints in this sample and prior chronic stress research (Fan et al., 2015): 1) a *resilient*

group who remained in the normal range across all timepoints (n = 143); 2) a *moderate*

fluctuating group who were in the moderate range at one or more timepoints but the normal

range for all other timepoints (n = 43); 3) an *early psychological trauma recovery group* who

met for clinical psychological trauma in spring and/or summer 2020, but not fall 2020 or spring

2021 (n = 25); 4) a *delayed psychological trauma group* who met for clinical psychological

trauma in fall 2020 or spring 2021, but not spring or summer 2020 (n = 8); and 5) a *chronic*

psychological trauma group who remained in the moderate or clinical psychological trauma

range across all timepoints (n = 17). Because the third and fourth groups, particularly the delayed

PTSD group, had small sample sizes, these were collapsed into a single *severe fluctuating group* who were in the clinical psychological trauma range at one or more timepoints but the moderate and normal range for the other timepoints ($n = 33$).

Predictors of Psychological Trauma Symptoms during the COVID-19 Pandemic

Results for the chi-square and ANOVA analyses comparing the four psychological trauma groups are presented in Table 3. Biological sex significantly differed across the four psychological trauma groups, $\chi^2 = 13.59$, $p = .004$ (see Figure 1b for mean psychological trauma symptoms for males vs. females at each timepoint). Specifically, females were significantly more likely than males to be in the severe fluctuating group ($p < .024$) and significantly less likely than males to be in the resilient group ($p < .001$). Females and males did not significantly differ in their likelihood to be in the moderate fluctuating or chronic psychological trauma groups, ps > .102. ADHD diagnostic status did not significantly differ across the four identified psychological trauma groups, $\chi^2 = 2.03$, $p = .567$. Internalizing disorders diagnostic status marginally differed across the four identified psychological trauma groups, $\chi^2 = 6.60$, $p = .086$ (see Figure 1c for mean psychological trauma symptoms for adolescents with vs. without an internalizing disorder at each timepoint). Post hoc comparisons found that adolescents with pre-existing anxiety or depressive diagnoses were significantly more likely to be in the chronic psychological trauma group relative to adolescents without pre-existing internalizing disorders ($p = .025$). Adolescents with and without an internalizing diagnosis did not differ significantly in their likelihood to be in the resilient, moderate fluctuating, or severe fluctuating groups, ps > .146. Finally, COVID-19 impact significantly differed across the four identified psychological trauma groups, $F = 2.65$, $p = .050$. The chronic psychological trauma group had significantly higher COVID-19 impact than the moderate fluctuating group, $p = .039$, and marginally higher COVID-19 impact than the

resilient group, $p = .073$. However, the chronic psychological trauma group did not significantly differ from the severe fluctuating group, $p = .396$, and the resilient group did not significantly differ from the moderate fluctuating group, $p = .840$.

Discussion

This study sought to extend the limited research on psychological trauma amongst adolescents during the COVID-19 pandemic. Our study was uniquely suited to assess differences over time and predictors of psychological trauma symptoms over time, with four COVID-19 timepoints spanning a year of the pandemic. We found that the highest rate of moderate or clinical psychological trauma symptoms (25%) was during stay-at-home orders in spring 2020. Despite rates dropping in summer 2020, ~20% of adolescents still displayed elevated psychological trauma symptoms in spring 2021. Notably, 60% of adolescents in our study demonstrated resilience throughout the first year of the pandemic, with no elevations in psychological trauma symptoms at any timepoint. However, 14% displayed clinical psychological trauma symptoms at one timepoint or more and 7% displayed chronic psychological trauma across all timepoints. Females and adolescents with pre-existing internalizing disorders reported higher levels of psychological trauma symptoms during the pandemic, and were more likely to be in the severe fluctuating or chronic psychological trauma groups, respectively. Adolescents who reported higher COVID-19 impact displayed chronic psychological trauma symptoms during the first year of the COVID-19 pandemic. These results, consideration of the COVID-19 pandemic within DSM-5 nosology, and possible interventions to help adolescents that have psychological trauma symptoms are discussed next.

The highest level of psychological trauma was observed early in the pandemic, during the stay-at-home orders of spring 2020, with large decreases in psychological trauma by summer

2020 that remained low, on average, from summer 2020 to spring 2021. This finding suggests that the sudden increase in COVID-19 infections, frequent media stories, and rapid transition to stay-at-home orders resulted in high rates of posttraumatic stress during spring 2020; however, once stay-at-home orders had lifted in summer 2020 and many individuals returned to some pre-COVID-19 normality (e.g., in person interactions) these symptoms significantly decreased and remained low for most adolescents. Similarly, the proportion of adolescents in our sample who displayed clinical psychological trauma symptoms dropped from 13.2% in spring 2020 to 8.5% in summer 2020. However, the proportion of adolescents who displayed moderate or clinical psychological trauma symptoms remained substantial in fall 2020 and spring 2021 (18.7% and 19.4%, respectively). This is consistent with previous literature examining the prevalence of posttraumatic stress symptoms after a chronic stressor, with some studies showing that symptoms can develop a while after the onset of the stressor and persist several years after the initial event (e.g., Jin et al., 2019). Alternatively, it is possible that the summer 2020 timepoint had a drop in psychological trauma symptoms given that adolescents were not in school and exposed to the stressful school-related challenges (e.g., shifting from remote to in-person schooling) that were present during the academic year. Further, we identified four groups representing patterns of change in psychological trauma: a resilient group (normal range at all four timepoints; 60.1%), a moderate fluctuating group (moderate range at ≥1 timepoint; 18.1%), a severe fluctuating group (clinical psychological trauma symptoms range at ≥1 timepoint; 13.9%), and a chronic psychological trauma group (moderate or clinical psychological trauma symptoms at all timepoints; 7.1%). Although it is encouraging that 60% of adolescents remained resilient throughout the first year of the COVID-19 pandemic, it is concerning that 40% of adolescents displayed moderate or clinical psychological trauma symptoms at least once during

this time. Given this high proportion, it is critical to examine potential predictors of such

elevations in psychological trauma.

We examined biological sex, pre-COVID-19 mental health diagnoses, and COVID-19

impact as predictors of psychological trauma. Females were more likely than males to be in the

severe fluctuating group and significantly less likely than males to be in the resilient group. The

fact that females reported higher psychological trauma symptoms and were more likely than

males to display clinical psychological trauma at some point in our study aligns with previous

literature on traumatic events in youth (e.g., Garza & Jovanovic, 2017; Guessoum et al.,

2020). Similarly, and consistent with prior research (e.g., Schwartz et al., 2017), we found that

adolescents with pre-existing anxiety or depressive diagnoses were significantly more likely to

be in the chronic psychological trauma group relative to adolescents without pre-existing

internalizing disorders. Given our sample size and analyses, we were not able to simultaneously

examine the impact of biological sex and internalizing disorders. However, the fact that

differences were found for different groups across these two predictors (i.e., severe fluctuating

and resilient for sex and chronic severe for internalizing disorders), suggests that we are not

merely identifying the same at-risk sub-population with these two predictors. Based on research

with other traumatic events and chronic stressors (e.g., McFarlane, 1987), we expected that

adolescents whose families were more impacted by the pandemic early on would have more

severe and longer duration of psychological trauma. Consistent with our hypothesis, the chronic

psychological trauma group had higher family COVID-19 impact than the moderate fluctuating

group and the resilient group.

In contrast, and inconsistent with prior literature (e.g., Swansburg et al., 2021; Ucar et al.,

2021), ADHD diagnostic status did not significantly differ across the four identified

psychological trauma groups, despite adolescents with ADHD having parents who reported

higher family COVID-19 impact at the bivariate level. It is possible that the unique

circumstances brought on by the COVID-19 pandemic (e.g., less social interactions, more

flexibility in learning) may have actually resulted in some positive outcomes for adolescents with

ADHD (e.g., less bullying, less demand on sitting and attending for extended periods of time;

Chawla et al., 2020; McFayden et al., 2021) and thus somewhat less psychological stress for

these adolescents. Another potential explanation for why adolescents with ADHD are not

displaying higher psychological trauma symptoms during the pandemic is that there they are

worrying less about the pandemic than adolescents without ADHD (i.e., are less likely to

experience worries about themselves, family, or friends being infected or about their physical or

mental/emotional health being negatively impacted by COVID-19; Dvorsky et al., 2021).

The DSM-5 nosology for PTSD and Acute Stress Disorder largely focuses on traumatic

events that 1) are related to actual or threatened death, serious injury, or sexual violence; 2)

happen in the past; and 3) have a clear start and end (APA, 2013). However, these criteria do not

fully capture the chronic traumatic stress brought on from the COVID-19 pandemic, which

includes the fear of future trauma (e.g., COVID-19 exposure, death of family or friends, negative

impact of the pandemic on the adolescent's future); prolonged social isolation; and significant

occupational, academic, and financial stressors (Bridgeland et al., 2021). Prior research found

that individuals exhibited "PTSD-like symptoms" for events that had not yet happened, whether

they had been indirectly or directly exposed to COVID-19, and that this anticipatory fear about

future trauma was the best predictor of PTSD-like symptoms (Bridgeland et al., 2021). This

finding is also consistent with prior research that has shown that thinking about future trauma

can lead to PTSD symptoms outside of the COVID-19 pandemic (e.g., Goutaudier et al., 2019).

Additionally, unlike many traumas, the onset and end of the traumatic event for COVID-19 is unclear and may affect individuals differently at different times, with some adolescents perhaps not experiencing elevated symptomatology for months or even years after the end of the stressor. This possibility is highlighted from the results in the current study, with a small portion (3.4%) of adolescents who did not display elevated psychological trauma symptoms until fall 2020 or spring 2021 and ~20% adolescents who remained in the moderate to clinical psychological trauma range in spring 2021. In addressing this critical psychological need, it seems prudent to not wait until after the chronic stressor (i.e., COVID-19 pandemic) is over, nor to rely on a formal DSM-5 diagnosis such as PTSD or Acute Stress Disorder, to intervene.

Given the unique circumstances of everyone being affected by the COVID-19 pandemic, school-based mental health services may be an ideal way to intervene and reduce the psychological impact of the pandemic for adolescents. School-based mental health services provide crucial services to adolescents that otherwise may not receive any assistance; for example, 35% of adolescents who receive services in a school setting have not received any mental health services elsewhere (Lipari et al., 2016). Our study suggests that approximately 20% of adolescents are still displaying moderate to severe psychological trauma symptoms as of spring 2021, with females, adolescents with pre-existing internalizing disorders, and adolescents whose families were most impacted by the pandemic (e.g., family members infected or hospitalized, financial/employment impacts) being the most vulnerable. Prior evidence suggests that early school-based intervention is most effective in helping students after a traumatic event (Yule, 1992); as such, we believe that school-wide intervention is critically needed during the 2021-2022 school year. One school-based intervention that has shown efficacy in decreasing psychological trauma symptoms in youth is Cognitive Behavioral Intervention for Trauma in

Schools (CBITS). CBITS uses cognitive-behavioral approaches (e.g., psychoeducation, relaxation, social problem solving, cognitive restructuring, exposure) to lessen symptoms of PTSD, depression, and behavioral issues, and to enhance functioning, grades and attendance, peer and parent support, and coping skills in students from late elementary through high school (Jaycox et al., 2012). Importantly, CBITS can be delivered by anyone who provides mental health services in the school setting (e.g., school counselors) and has a free 5-hour web-based training course available and a publicly available manual (https://www.rand.org/content/dam/rand/pubs/tools/TL200/TL272/RAND_TL272.pdf) . This ensures feasibility for broad dissemination and implementation of CBITS by school mental health professionals. A few studies (e.g., Allison & Ferreira, 2016; Morsette et al., 2009; Wolmer et al., 2011) have shown that students experienced significant decline in PTSD, stress, and depression symptoms after treatment, including among students who did not meet criteria for PTSD. This suggests that school-based mental health programs can assist in reducing psychological trauma symptoms as well as other psychological concerns in the aftermath of the COVID-19 pandemic, which is crucial.

These findings need to be considered within the context of several limitations. First, our sample was predominately White and from middle to upper socioeconomic backgrounds. Given the disproportionate impact of the pandemic on Black and Latinx Americans and families from lower socioeconomic statuses, it is possible that our observed rates of psychological trauma may be an underestimate. Relatedly, it is possible that families who continued to participate in our study were less impacted early on by the COVID-19 pandemic and/or the civil unrest in the United States during this time, and thus are experiencing less psychological stress. Similarly, it is important to note that we did not administer the CATS pre-COVID-19, as this measure was

modified to be specific to the pandemic. However, only three participants met diagnostic criteria

for PTSD pre-COVID-19 based on parent and self-report on a diagnostic interview, suggesting

that the observed rates of psychological trauma likely do not result from other traumatic

exposure. Additionally, although our prospective examination of change in psychological trauma

symptoms is a strength, ideally more sophisticated analyses such as latent trajectory analysis

could be used to identify subgroups and patterns of change in symptoms over time.

Unfortunately, our sample was underpowered for such analyses; this is an important area for

future research. Finally, half the sample was specifically recruited for ADHD and common

psychological comorbidities pre-COVID-19, ADHD diagnosis is overrepresented. Despite these

limitations, our study showed that females, those with a pre-existing internalizing disorder, and

adolescents whose families were most impacted by COVID-19, were more susceptible to

experiencing psychological trauma symptoms during the pandemic. In addition, we found that

although psychological trauma symptoms decreased for most adolescents after stay-at-home

orders, 20% remained in the moderate to severe range through spring 2021. Helping address

these widespread psychological trauma symptoms among adolescents is critical.

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Figure 1

Psychological Trauma Symptoms During the First Year of the COVID-19 Pandemic for (a) Entire Sample, (b) Males vs/ Females, and (c) Adolescents with vs. without an Internalizing Disorder pre-COVID-19.
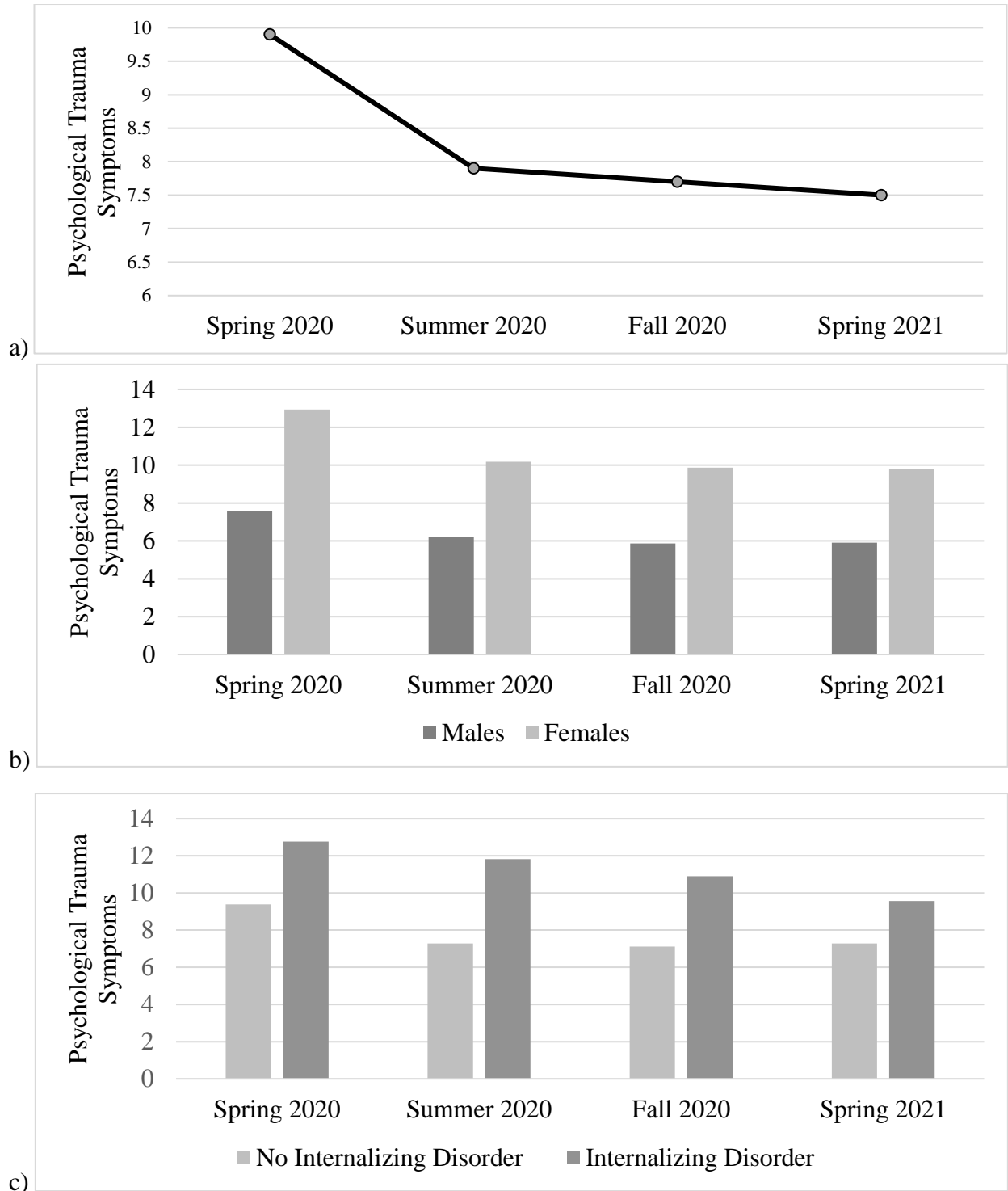

a)

b)

c)

Table 1

Descriptive Statistics and Correlations Between Study Variables

Variable	*M(SD)* or %	1	2	3	4	5	6	7	8
1. Biological Sex	44.9%	--							
2. ADHD Status	49.6%	-.20**	--						
3. Anx/Dep Status	16.1%	.14*	.07	--					
4. COVID-19 Family Impact	23.4 (10.3)	.01	.16*	.03	--				
5. Spring 2020 Trauma Sx	9.9 (9.7)	.28***	-.09	.13	.21**	--			
6. Summer 2020 Trauma Sx	7.9 (8.4)	.24***	-.01	.19**	.12	.72***	--		
7. Fall 2020 Trauma Sx	7.7 (8.4)	.24**	.01	.16*	.15*	.66***	.74***	--	
8. Spring 2021 Trauma Sx	7.5 (8.6)	.22**	-.02	.09	.07	.52***	.59***	.75***	--

Note. Biological sex is presented as % female (0 = male, 1 = female), ADHD Status is presented as % diagnosed with ADHD (0 = no ADHD diagnosis, 1 = ADHD diagnosis), and Anx/Dep Status is presented as % diagnosed with an anxiety or depressive disorder (0 = no anxiety or depressive disorder diagnosis, 1 = anxiety or depressive disorder diagnosis). ADHD = attention-deficit/hyperactivity disorder, Anx = anxiety, Dep = depression, COVID-19 = Coronavirus Diseased 2019, Trauma Sx = psychological trauma symptoms as measured by the Child and Adolescent Trauma Screen. *p < .05, ** p < .01, *** p < .001.

Table 2

Frequency of Moderate and Clinical Psychological Trauma Symptoms across COVID-19 Timepoints

Timepoint	Not Clinically Elevated %	Moderate Psychological Trauma Symptoms %	Clinical Psychological Trauma Symptoms %
Spring 2020	74.9%	11.9%	13.2%
Summer 2020	82.9%	8.5%	8.5%
Fall 2020	81.3%	11.5%	7.2%
Spring 2021	80.5%	12.4%	7.0%

Table 3

Chi-Square and ANOVA Analyses Comparing Psychological Trauma Groups

Variable	Resilient Group % or *M(SD)*	Moderate Fluctuating Group % or *M(SD)*	Severe Fluctuating Group % or *M(SD)*	Chronic Psychological Trauma Group % or *M(SD)*	χ² or *F*
Biological Sex					13.59**
Males	70.8%	15.4%	9.2%	4.6%	
Females	48.1%	21.7%	19.8%	10.4%	
ADHD Diagnostic Status					2.03
Comparison	58.0%	20.2%	16.0%	5.9%	
ADHD Dx	63.2%	16.2%	12.0%	8.5%	
Internalizing Disorder Diagnostic Status					6.60┼
Comparison	62.6%	17.2%	14.6%	5.8%	
Internalizing Dx	50.0%	23.7%	10.5%	15.8%	
COVID-19 Impact	23.01 (10.27)	21.53 (8.92)	24.61 (9.49)	29.41 (10.34)	2.65*

Note. Dx = diagnosis. ┼ *p* < .10, **p* < .05, ** *p* < .01.