EMPIRICAL RESEARCH

The Impact of COVID-19 Experiences on Adolescent Internalizing Problems and Substance Use Among a Predominantly Latinx Sample

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Abstract

Given the salience of socialization factors on adolescence and their role in vulnerability to disasters and trauma, this study examined whether COVID-19-associated fears and impacted quality of life mediated associations between pandemic-focused family conversations and media exposure and subsequent youth mental health. A primarily Latinx sample of adolescents ($N = 167$; Mage $= 16.2$ years, 44.9% female) participated in a longitudinal (summer 2020-winter 2020) COVID-19 study. COVID-19 media exposure predicted engagement in relevant safety behaviors, which negatively impacted quality of life, which in turn predicted increased internalizing problems. COVID-19 family conversations predicted social distancing fears, which negatively impacted quality of life, which then in turn also predicted increased internalizing problems. Targeting key socialization factors may minimize negative consequences following major community trauma among adolescents.

Keywords COVID-19 · Media exposure · Family conversations · Quality of life · Mental health

Introduction

Adolescence is a particularly salient developmental period with respect to its influence on an individual's functioning across the lifespan. Prior work supports adolescence as a time of significant opportunity and growth as it is a period that can position an individual to maximize their opportunities later in life (Layne et al., 2014). Adolescence is also a critical period wherein a significant portion of youth develop social-emotional mental health problems, including depression and anxiety, that may persist well into the adult years (Rapee et al., 2019). Moreover, the experience of significant traumatic life events can exacerbate increased levels of vulnerability that characterize this developmental period (Dick et al., 2021; McLaughlin & Lambert, 2017). There is a notable dearth of longitudinal studies that examine potential mechanisms linking behaviors and attitudes specific to traumatic events with the subsequent emergence of mental health problems and substance use, while also accounting for preexisting symptomatology. Redressing this gap can help refine preventative interventions and inform public health policies aimed at mitigating the negative impact of community traumas. Although there are likely some factors that are unique to Coronavirus disease 2019 (COVID-19), the current pandemic provides a unique opportunity to gain a greater understanding of relevant developmental processes that may contribute to mental health problems during major traumatic events that disrupt and overwhelm entire communities. Given the increased salience of socialization factors on adolescent functioning, the current study examines processes by which trauma-specific social factors (i.e., COVID-19-related media and family conversations) contribute to the emergence of mental health problems and substance use among a primarily Latinx sample of adolescents.

Adolescence is a key developmental period that is characterized by significant physical, cognitive, and emotional changes. In addition, there are significant changes that take place within an adolescent's social milieu. Namely, the

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salience of various key social contexts, such as parents and the family, start to shift as peers and friends start to take a more prominent role influencing the attitudes and behaviors of youth (Trucco, 2020). Moreover, increased use of personal electronic devices among adolescents, coupled with technological advances providing 24-hour access to images, videos, and text messages, has enchanced the influence of more traditional forms of media (e.g., television, radio) and social media on adolescents' attitudes, behaviors, and well-being (Moreno et al., 2018). An individual's level of success in navigating these developmental changes could inform the likelihood of developing mental health problems later in life.

Given this already tumultuous period of life, certain life events that an individual experiences during adolescence can either interfere with or enhance the likelihood of adaptive functioning in adulthood. In particular, major traumatic experiences, such as the COVID-19 pandemic and other related public health crises, can have a significant impact on an adolescent's adaptive functioning (McLaughlin & Lambert, 2017). COVID-19 was declared a global pandemic by the World Health Organization (WHO) in March 2020 (World Health Organization, 2020). The Centers for Disease Control and Prevention (CDC) reports that in the U.S., over 36.2 million adults and 6.8 million youth were infected with COVID-19 between January 2020 and December 2021, resulting in over 820,000 deaths to date (CDC, 2021b). Beyond the adverse physical health consequences (CDC, 2021a), the pandemic has significantly impacted the livelihoods of individuals. While transitioning to remote learning helped adolescents safely continue their education, it posed a number of challenges (Shah et al., 2020). Altogether, disruptions to daily routines, increased media exposure, and amplified caregiver burden has led to increased worry and stress (Hertz & Barrios, 2021). Thus, even among those who have not contracted the virus, COVID-19 has had a notable impact.

The COVID-19 pandemic has also highlighted health disparities suffered by Latinx populations in the U.S. (Clay et al., 2021). When compared to white, non-Latinx populations in the U.S., Latinx populations have nearly 1.6 times greater prevalence of COVID-19 infection, 2.5 times greater prevalence of related hospitalization, and a 2.1 times greater prevalence of related deaths (CDC, 2021c). Yet, examinations of mental health within Latinx samples have produced mixed findings; some studies indicate that Latinx individuals endorse greater rates of mental health concerns than non-Latinx white individuals (The Commonwealth Fund, 2020), while others indicate lower mental health symptomatology (Penner et al. 2021). Thus, prospective work examining potential pathways leading to mental health problems and substance use in this population is necessary.

Prior work indicates that substance use increases following traumatic events (Goncalves et al., 2020). During

COVID-19, studies have focused on adults and findings support increased alcohol use (Goncalves et al., 2020). Yet, few studies have focused on youth. An exception is a study of Canadian adolescents wherein marijuana use (girls only), e-cigarette use, and binge drinking all decreased, but researchers found greater frequency of alcohol use compared to pre-pandemic rates (Dumas et al., 2020). Beyond this preliminary research, studies have not examined the impact of COVID-19 on youth substance use. Moreover, much of the existing work was conducted in the early months of the pandemic and relied on cross-sectional retrospective reports.

The developmentally-based bidimensional trauma framework (DBTF; Kira et al., 2008) is useful for understanding the impact of severe traumatic stressors on adolescent functioning. Consistent with multifinality, a central tenet of developmental psychopathology (i.e., a similar origin results in differing outcomes), DBTF posits that traumatic events can either impede or enhance individual development across the life span. Moreover, DBTF highlights the importance of integrating an individual's developmental experiences to understand increased vulnerability to stressors or resilience. This includes social support systems (i.e., parents and peers), but also considers the increasing role of technological capacities and mass communication that contribute to an individual's experience of life events (Kira et al., 2008). This may be especially salient during the COVID-19 pandemic as adolescents relied more heavily on media, including social media, given quarantine regulations and social isolation rules. Understanding how media contributes to adolescent distress and functioning is increasingly critical as media access grows and visual coverage becomes more graphic in nature (Comer et al., 2008, 2016; Dick et al., 2021). While social media can provide access to health information and facilitate social connection, increased use has been associated with internalizing symptoms (Keles et al., 2019). Research has linked youth exposure to trauma-related media (e.g., coverage of terrorist attacks) with elevated threat perceptions and post-traumatic stress symptoms (Comer et al., 2010; Dick et al., 2021). Among adults, increased traditional and social media use to acquire pandemic-related information has been linked with distress (Riehm et al., 2020). However, little is known about how COVID-19 media exposure impacts adolescents, especially when accounting for pre-pandemic mental health symptomatology. It is possible that COVID-19 media exposure can simultaneously play a critical role in educating adolescents on safety precautions while also contributing to stress.

During public health crises, interpersonal communication becomes another source of information. During the Zika outbreak, one study found that virus-related conversations with others had a significant effect on virus-

related fear (Yang et al., 2018). Given the salience of the family during this developmental period, a similar examination on links between family conversations regarding COVID-19 on adolescent well-being may prove equally informative. Although family conversations regarding CDC recommendations may keep youth from contracting an illness, this may ultimately impact their quality of life and well-being. For example, high levels of disaster-related topic rumination within families is associated with youth anxiety and depression (Carpenter et al., 2017; Felix et al., 2020). While it is plausible that family conversations regarding personal and social hygiene may promote adolescent safety behaviors, they may also have a long-term negative impact.

Current Study

Adolescence marks a critical developmental period that confers greater risk for the onset of mental health problems and substance use. Moreover, traumatic life stressors that are experienced during adolescence represent salient risk factors in the development of adult psychopathology, including depression, anxiety and substance use disorder. Although the COVID-19 pandemic is distinct in many ways, it also provides a unique opportunity to understand processes through which large-scale collective traumas (e.g., mass shootings, natural disasters) contribute to the development of clinical symptomatology and maladaptive functioning. Given the salience of socialization factors in adolescence and their contribution to vulnerability to major traumatic events, this study examined potential mechanisms linking exposure to COVID-19-related media and family conversations on adolescent internalizing problems and substance use above and beyond pre-pandemic internalizing symptoms. A longitudinal serial mediation model was estimated to examine whether COVID-19-related fears (e.g., behaviors related to illness fears, angst, social distancing) and the subjective impact of COVID-19 on quality of life mediated the association between social influences (i.e., COVID-19-related media exposure and family conversations) on internalizing problems and substance use among a primarily Latinx adolescent sample ranging in age from 14 to 18 years of age (mean = 16.2). COVID-19-related social influences were expected to be positively associated with greater COVID-19-related fears. In turn, it was expected that COVID-19 related fears would have a negative impact on youth's quality of life. It was expected that COVID-19-related fears would have a more immediate impact on quality of life; thus, they were assessed at the same timepoint. These processes were expected to increase internalizing problems. Yet, given discrepant findings, a hypothesis for substance use was not formulated.

Methods

Design and Sample

The sample was comprised of adolescents ($n = 167$; age 14–18 [mean = 16.2], 44.9% female, 85.0% white, 7.8% Black, 7.2% other, 83.2% Latinx [3.6% Mexican heritage; 12.9% Puerto Rican heritage; 39.6% Cuban heritage; and 59.0% other Latin heritage]) participating in an online sub-study focused on the impact of COVID-19 experiences among adolescents. Adolescents came primarily from households where parents were married (78.4%), had at least some college education (82.0%), and had a family income of at least \$35,000 (59.2%). The larger parent study ($N = 276$; 49.2% female, 84.8% Latinx), the ACE Project, is an ongoing, multi-wave investigation of e-cigarette initiation (Hartmann et al., 2021; Trucco et al., 2021). Eligibility criteria for the parent study included: being a freshman/ sophomore in high school, no diagnosis of a learning, intellectual, or physical disability, no diagnosis of a neurological disorder or disorder characterized by psychotic or paranoid symptoms, and English proficiency. Furthermore, given the parent study's primary objective, adolescents had to endorse at least one of the following risk factors: elevated sensation seeking and/or impulsivity, endorse that a friend/ sibling had tried a substance, or endorse intentions to use cigarettes and/or e-cigarettes. Importantly, only 2.6% of screened participants did not meet a high-risk criterion. Thus, the larger sample is likely representative of regional high school students with respect to substance use. All participants who were enrolled in the parent study were eligible and invited to participate in this online sub-study. Participants were more likely to be female, $\chi2$ (1, $N = 276$) $= 5.71$, $p = 0.02$, compared to the larger study.

Ethical Considerations

Written informed consent and assent was obtained from the parents and adolescents, respectively. All procedures were performed in accordance with the ethical standards of the institutional committee where the study was conducted and with the 1964 Helsinki declaration and its later amendments.

Procedures

Adolescents provided contact information for their parents during recruitment events. Parents were then contacted and provided with information regarding the study. All participants who were eligible for the larger study were invited to participate in the multi-wave COVID sub-study via email, which consisted of completing parent- and adolescent-reported questionnaires reflecting COVID-19 experiences, as well as items assessing remote learning, mental health, and substance use.

For this study, only adolescent measures were examined. Assessments for the sub-study occurred during the following time periods: Time 0 (T0) summer 2020, Time 1 (T1) fall 2020, and Time 2 (T2) winter 2020. Consent and assent forms, as well as questionnaires were accessible to participants via REDCap (Harris et al. 2019) links and took approximately 1 h to complete. Participants were compensated $15 at T0, $20 at T1, and $25 at T2 for questionnaire completion.

Measures

COVID-19-related family conversations (T0)

Adolescent participants rated the degree to which their family had conversations about COVID-19 and their experiences with the pandemic (e.g., the importance of hand washing, germs and preventing their spread, protecting the elderly or other vulnerable people) using a 12-item measure ($\alpha = 0.89$).

COVID-19-related media usage (T0)

Participants rated how many hours per day on average they spent across seven different media outlets (television, internet, social media, magazines, newspapers, radio, other) for information on COVID-19. Data on media usage was not available for two partipants.

COVID-19-related fears (T1)

Items adapted from the Fear of Illness and Virus Evaluation (FIVE; Ehrenreich-May, 2020) were used to derive three subscales. COVID-19 behaviors related to illness and virus fears were assessed using 9 items (e.g., using hand sanitizer; $\alpha = 0.84$). COVID-19 angst relating to the likelihood that they or their family members would contract, get seriously ill from, or die from the virus was assessed using 7 items ($\alpha = 0.84$). Social distancing fears were assessed using 10 items (e.g., "I am afraid I will not be able to see friends for a long time because of a bad illness or virus"; $\alpha = 0.86$).

Impact of COVID-19 on quality of life (T1)

An average of two items ($r = 0.70$) from the FIVE assessed how COVID-19 has impacted adolescents' quality of life and mental health (i.e., "being afraid of an illness or virus has caused me to feel strong emotions in my body" and "being afraid of an illness or virus has gotten in the way of enjoying my life") (Ehrenreich-May, 2020).

Internalizing problems (T2)

A latent variable was derived from the Depression Anxiety Stress Scales (DASS; Antony et al., 1998) whereby higher values indicated more internalizing problems. The DASS includes seven-items across each of the three subscales: stress (e.g., "I found myself getting agitated"), depression symptoms (e.g., "I felt that I had nothing to look forward"), and anxiety symptoms (e.g., "I worried about situations in which I might panic and make a fool of myself"). Standardized factor loadings ranged from 0.79 to 0.92 (p's < 0.001).

Substance use (T2)

Participants were asked, "In the past month, have you used any of the following?" and to select all that apply from the following options: cigarettes, e-cigarettes, alcohol, marijuana, prescription medications more than prescribed, or substances not listed. A sum of these dichotomous items was created to reflect substance use in the past month.

Statistical Analysis

A serial mediation path model was estimated using Mplus software v7.4 (Muthén and Muthén, 1998–2017). The model included social influences at T0 (i.e., COVID-19 media exposure, family conversations) predicting COVID-19 related fears at T1 (i.e., COVID-19 behaviors, angst, social distancing fears). In turn, COVID-19 related fears at T1 were estimated as predictors of the subjective impact of COVID-19 on quality of life at T1. Lastly, the impact of COVID-19 on quality of life at T1 was tested as a predictor of internalizing problems and substance use at T2. Biological sex (0 = female) was included as a covariate given prior work indicating differences across sex with respect to internalizing problems and substance use (e.g., Peltier et al., 2019). Additionally, a pre-pandemic internalizing subscale of the Youth Self-Report measure (Achenbach & Rescorla, 2001) collected between March 2018 and December 2019 was included as a covariate. Percentile bootstrap confidence intervals (CI) were estimated with 10,000 samples to examine indirect effects (see Fig. 1 for a conceptual model). Of the 167 participants that completed the T0 assessment, 121 completed T1, and 124 completed T2. Patterns of missingness were not detected across timepoints. Missing data were handled using full information maximum likelihood estimation.

Results

Table 1 provides descriptive statistics and correlations for study variables. Of particular interest, differences across biological sex were not evident beyond engagement in COVID-19 safety behaviors and stress. Pre-pandemic internalizing symptoms were associated with a greater negative impact on COVID-19 quality of life, greater stress, and greater anxiety symptoms. The estimated serial

Fig. 1 Conceptual serial mediation model. T0 = Time 0 (summer 2020), T1 = Time 1 (fall 2020), T2 = Time 2 (winter 2020)
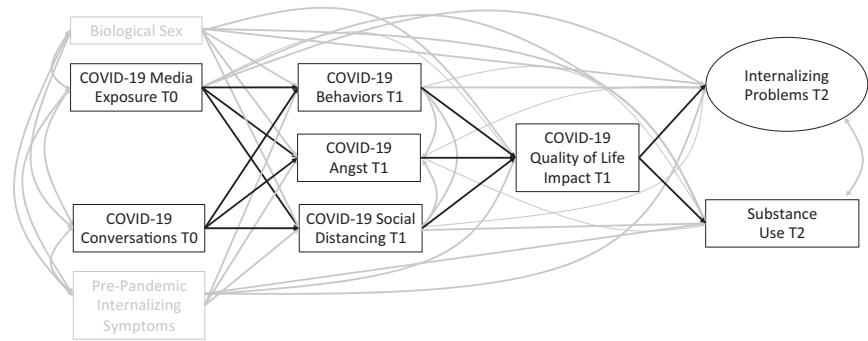
mediation path model provided a good fit to the data (see Fig. 2) and accounted for approximately 28% of the variance in internalizing problems. COVID-19 media exposure predicted greater engagement in COVID-19 safety behaviors, which in turn was associated with a greater impact of COVID-19 on quality of life. Lastly, COVID-19's impact on quality of life predicted internalizing problems. The indirect effect from COVID-19 media exposure to internalizing problems was significant (0.039, 95% percentile bootstrap CI = 0.002–0.096). COVID-19 family conversations predicted greater COVID-19 social distancing fears, which in turn was associated with a greater impact of COVID-19 on quality of life. The indirect effect from COVID-19 family conversations to internalizing problems was significant (0.154, 95% percentile bootstrap CI = 0.006–0.373). The model accounted for 5% of the variance in substance use. Study variables did not significantly predict substance use (Table 2).

Sensitivity Analyses

Exploratory analyses were also conducted to determine pathways to a latent substance use construct that included early precursors of substance use risk. Given quarantine and social isolation procedures, adolescents may have had limited opportunities to access substances during the pandemic. It is possible that even though COVID-19 experiences may not impact actual substance use, they may contribute to the development of favorable substance use attitudes that typically precede substance use behaviors. Namely, a latent variable was also derived from the summed substance use variable along with two substance use curiosity items (e.g., "have you ever been curious about using an e-cigarette") and two substance use intention items (e.g., "how likely is it that you will be using an e-cigarette 1 year from now"). Standardized factor loadings ranged from 0.42 to 0.93 and were all statistically significant ($ps < 0.001$). Findings were consistent with the observed substance use variable. In addition, given that our sample included participants in mid-

to late-adolescence, models were also estimated that included age as a covariate. Findings did not support age as a significant predictor in the model and results were largely consistent.

Discussion

As large-scale collective traumas become more frequent and severe (Leaning & Guha-Sapir, 2013), researchers need to focus on identifying processes underlying the development of maladaptive outcomes, including mental health problems and substance use, especially among youth. A greater understanding of factors increasing youth vulnerability to the maladaptive consequences of traumatic events could inform preventative interventions and public health decision-making. While certain health recommendations may mitigate disease spread, they will undeniably impact youth well-being. The COVID-19 pandemic provides a unique opportunity to identify factors that may be leveraged to promote the health and well-being of youth. The current study addresses gaps in prior work by prospectively examining the role of COVID-19-related fears (i.e., behaviors, angst, social distancing) and youth perceptions on COVID-19's impact on their quality of life as possible mediators in the association between social influences (i.e., COVID-19-related family conversations and media exposure) and subsequent internalizing problems and substance use. Findings support the role of COVID-19 safety behaviors and social distancing (but not angst) as mediators. This is consistent with prior work indicating that hygiene-related activities and social distancing recommendations are highly salient among adolescents, but likely to contribute to reductions in psychological well-being (Riiser et al., 2020).

Media Exposure and Health Recommendations

Similar to other large-scale disasters, COVID-19 information is disseminated through mass media communication.

Table 1 Descriptive statistics and bivariate correlations

	Mean	SD	Range	2	3	4	5	6	7	8	9	10	11	12
1. Biological sex (0 = female)	0.45	–	0–1	0.05	-0.01	0.15	-0.18*	-0.03	-0.16	-0.07	-0.20*	-0.12	-0.11	-0.06
2. Internalizing symptoms	55.04	9.60	30–92	–	-0.01	0.01	-0.06	0.13	0.17	0.25*	0.22*	0.15	0.24*	-0.02
3. C-19 Conversations (T0)	2.48	0.76	0–4		–	-0.00	-0.05	0.05	0.20	0.18	0.16	0.12	0.12	0.04
4. C-19 Media Exp. (T0)	3.04	2.17	0.5–8			–	0.34***	0.14	0.20	0.12	0.04	-0.08	0.09	0.09
5. C-19 Behaviors (T1)	1.59	0.59	0.5–3				–	0.18*	0.23*	0.26**	0.09	-0.11	0.05	-0.08
6. C-19 Angst (T1)	1.93	0.70	1–4					–	0.45***	0.38***	0.07	0.11	0.03	0.04
7. C-19 Social Dist. (T1)	1.80	0.57	1–3.4						–	0.57***	0.25*	0.16	0.31**	0.08
8. C-19 Impact (T1)	1.74	0.87	1–4							–	0.43***	0.26**	0.38***	0.01
9. Stress (T2)	4.35	3.73	0–18								–	0.73***	0.75***	0.11
10. Depression Symp. (T2)	4.40	4.20	0–17									–	0.66***	0.18*
11. Anxiety Symp. (T2)	2.56	2.98	0–17										–	0.11
12. Substance Use (T2)	0.23	0.60	0–3											–

Note: n = 167; *C-19* COVID-19; *Exp.* exposure; *Dist.* distancing; *Symp* symptoms

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$ (two-tailed)

One supported pathway is that greater COVID-19-related media exposure predicted increased hygiene-related activities, such as effective handwashing (Tambling et al., 2021). Although guideline adherence likely reduced contracting COVID-19, this negatively impacted youth's quality of life, which ultimately predicted greater internalizing problems. This is notable given that individuals who are more anxious are more likely to seek out disaster-related media and also more vulnerable to psychological distress (Drouin et al., 2020).

Adopting hygiene-related behaviors also increased stress that resulted in lower quality of life. Prior work found that COVID-19 mass communication contributed to compulsions and obsessions over hygiene (Ares et al., 2021). Thus, COVID-19 media exposure can be a critical source of information that can be leveraged as a public health medium during public health crises, but it may also contribute to psychological distress. Public health messaging should focus on transmitting accurate information and dispelling common misperceptions to aid individuals in balancing hygiene-related activities and daily life functioning. Thoughtfully constructed messages may limit rather than exacerbate associated psychological distress. Families may also do well to limit the amount of media-based exposure teens consume during the course of traumatic events. The American Academy of Pediatrics recommends the usage of a Family Media Use Plan to limit when (i.e., screen free times [e.g., mealtimes]) and where (e.g., screen free zones [e.g., bedroom]) youth engage in media usage. In addition, families should limit media exposure to one or two trusted sources (e.g., Centers for Disease Control) to stay updated on critical information, while minimizing repetitious information and reduce exposure to reports whose veracity cannot be ensured, especially on social media (Garfin et al., 2020). Lastly, discussing media pieces in an effort to address fears or misinformation may have utility. Ultimately, public health messaging and psychoeducational resources for caregivers regarding effective engagement with and support of their teen's coping behavior during crises could benefit adolescent mental health.

Family Conversations and Social Distancing Fears

The CDC also released guidelines related to social distancing. The success in mitigating disease risk in youth relies heavily on caregivers' effectiveness in explaining these guidelines to children and scaffolding adherence to recommendations (Tambling et al., 2021; Yoon et al., 2015). A second significant pathway emerged linking family conversations regarding COVID-19 on internalizing problems. Namely, more family conversations regarding COVID-19 predicted increased social distancing fears. Social distancing fears, in turn, had a negative impact on

Fig. 2 Estimated serial mediation model. Values represent standardized path coefficients. Only significant paths are presented. Covariates and covariances were estimated but not depicted. Model fit: $\chi 2 = (18, N = 167) = 26.36, p = 0.09$, RMSEA $= 0.05$, CFI $= 0.98$, SRMR $= 0.03$. $^{*}p < 0.05$. $^{***}p < 0.001$
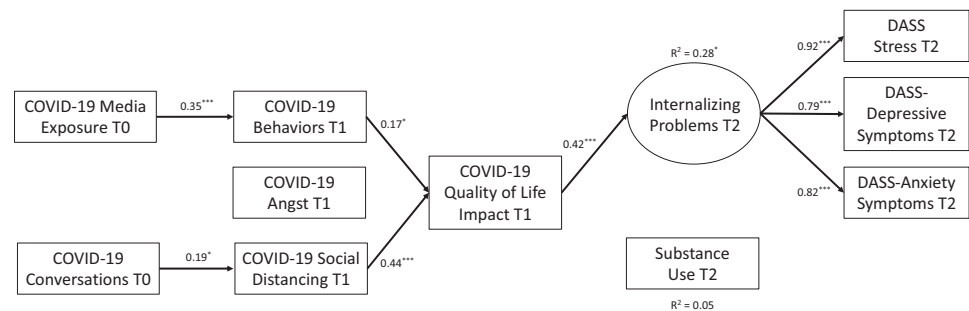
youth's quality of life, which in turn predicted greater internalizing problems. In contrast to hygiene-related behaviors whereby guidelines are more standardized and flowed directly from media, social distancing practices often vary across families and are largely dictated by caregivers. Prior work conducted on the impact of COVID-19 social distancing measures demonstrate that although physical interventions were effective in reducing COVID-19 transmission, they also had both negative short-term (e.g., loneliness) and long-term (e.g., depression) consequences (Benke et al., 2020; Brooks et al., 2020; Dubey et al., 2020). Moreover, consistent with current findings, limited social contact resulting from lockdown measures was often associated with increased psychopathological symptoms (Ares et al., 2021). As adolescence is a period when peers and socializing take center stage, it is not surprising that the psychosocial burden of physical interventions has had a profound negative toll on adolescents (Ares et al., 2021; Benke et al., 2020).

The current study offers greater precision regarding what aspects of family conversations related to COVID-19 may be most impactful on a youth's quality of life and well-being. Transmission of effective coping strategies by caregivers can be enacted directly through the conversations they elicit with their children, as well as indirectly by effectively modeling successful management of distress, boredom, and loneliness, such as engagement in physical activity, maintaining routines, and sustaining social connections. Similarly, adolescents learn from listening to conversations among adults and look to parents as models on how to respond during traumatic events. Parents should calibrate communication with their children and other adults based on their childrens' level of preoccupation. Moreover, public health campaigns that are thoughtfully designed for specific demographic groups offering emotional support and practical recommendations on how to cope with psychological distress could offset mental health consequences during crises. Leveraging social media platforms that are widely adopted among youth to promote alternative socialization practices (e.g., video apps) and those that promote psychological support services could alleviate stress and feelings of isolation.

Substance Use During the Pandemic

Adolescent substance use was not significantly predicted in our model. Though U.S. adults report increased substance use during the COVID-19 pandemic (Czeisler et al., 2020), rates of adolescent use have mostly stabilized or declined (Miech et al., 2021). Adolescents are usually subject to parental monitoring to limit their substance use; under lockdown orders, adolescents spend more time at home with their parents and thus experience greater monitoring, less privacy, and reduced access to substances (Gaiha et al., 2020). Thus, given lockdown and social isolation procedures, it is possible that the COVID-19 pandemic represents a unique event whereby risk for adolescent substance use may not generalize to other traumatic experiences. It is possible that once restrictions are lifted, rates of substance use will return to or exceed pre-pandemic levels. Yet, adolescent substance use was not significantly predicted in the model even when accounting for substance use attitudes, including curiosity and future intentions to use. It is important to note, the sample size, the low variance in substance use, and the potential overlap between substance use and internalizing problems (especially depressive symptoms), may have also contributed to the lack of significant paths to substance use.

Limitations and Future Directions

Despite the many strengths of our analyses, including the prospective study design and the inclusion of pre-pandemic

Table 2 Path estimates and covariances for serial mediation model

Standardized regression coefficients	B (SE)	p
Internalizing problems		
→ COVID-19 Quality of life impact	0.42 (0.11)	0.000
→ COVID-19 Angst	−0.083 (0.141)	0.555
→ COVID-19 Social distancing	0.006 (0.136)	0.963
→ COVID-19 Behaviors	−0.158 (0.128)	0.217
→ COVID-19 Media exposure	0.088 (0.135)	0.512
→ COVID-19 Conversations	0.098 (0.084)	0.243
→ Biological sex	−0.219 (0.087)	0.012
→ Pre-pandemic internalizing symptoms	0.173 (0.121)	0.154
COVID-19 Angst		
→ COVID-19 Media exposure	0.153 (0.107)	0.155
→ COVID-19 conversations	0.047 (0.087)	0.591
→ Biological sex	−0.044 (0.097)	0.651
→ Pre-pandemic internalizing symptoms	0.127 (0.107)	0.234
COVID-19 Social distancing		
→ COVID-19 media exposure	0.22 (0.114)	0.054
→ COVID-19 conversations	0.186 (0.087)	0.034
→ Biological sex	−0.173 (0.09)	0.054
→ Pre-Pandemic internalizing symptoms	0.167 (0.097)	0.087
COVID-19 behaviors		
→ COVID-19 media exposure	0.35 (0.107)	0.001
→ COVID-19 conversations	−0.039 (0.085)	0.649
→ Biological sex	−0.205 (0.09)	0.022
→ Pre-pandemic internalizing symptoms	−0.029 (0.1)	0.775
COVID-19 Quality of life impact		
→ COVID-19 Media exposure	−0.034 (0.09)	0.704
→ COVID-19 Conversations	0.083 (0.088)	0.346
→ COVID-19 Angst	0.128 (0.085)	0.129
→ COVID-19 Social distancing	0.438 (0.093)	0.000
→ COVID-19 Behaviors	0.169 (0.075)	0.024
→ Biological sex	0.048 (0.08)	0.544
→ Pre-pandemic internalizing symptoms	0.159 (0.087)	0.068
Substance use		
→ COVID-19 quality of life impact	−0.046 (0.132)	0.729
→ COVID-19 angst	0.05 (0.176)	0.778
→ COVID-19 social distancing	0.071 (0.145)	0.627
→ COVID-19 behaviors	−0.194 (0.126)	0.124
→ COVID-19 media exposure	0.146 (0.127)	0.248
→ COVID-19 conversations	0.029 (0.089)	0.740
→ Biological sex	−0.093 (0.091)	0.308
→ Pre-pandemic internalizing symptoms	−0.033 (0.094)	0.725
Covariances		
Substance use		
↔ Internalizing problems	0.149 (0.118)	0.206
COVID-19 media exposure		
↔ COVID-19 conversations	0.007 (0.111)	0.950
↔ Biological sex	0.143 (0.087)	0.100

Table 2 (continued)

Standardized regression coefficients	B (SE)	p
↔ Pre-pandemic internalizing symptoms	0.014 (0.099)	0.884
COVID-19 conversations		
↔ Biological sex	−0.006 (0.092)	0.948
↔ Pre-pandemic internalizing symptoms	−0.017 (0.091)	0.853
COVID-19 angst		
↔ COVID-19 social distancing	0.421 (0.095)	0.000
↔ COVID-19 behaviors	0.139 (0.103)	0.174
COVID-19 social distancing		
↔ COVID-19 behaviors	0.158 (0.094)	0.093
Pre-pandemic internalizing symptoms		
↔ Biological sex	0.064 (0.093)	0.491

internalizing symptomatology, certain limitations of the current study warrant discussion. First, the sample consisted of 167 adolescents between the ages of 14 and 18 and identified as predominately Latinx. The small sample size may have limited power to detect smaller effect sizes, especially as it relates to adolescent substance use. It is unclear whether findings generalize to younger children who likely experience other stressors (e.g., decreased social connection due to a lack of social media). Future research should examine whether findings generalize to different racial/ethnic populations, as well as age groups, using a larger sample size. Second, items on the FIVE assessed fears related to COVID-19 behaviors, angst, and social distancing rather than actual engagement in these behaviors. Moreover, assessments were all based on self-report. Third, quality of life was assessed with two items; future work should include the use of validated instruments that provide more comprehensive subdimensions. Fourth, it is important to interpret findings within the context of the limitations of observational research methodology whereby causation cannot be inferred. Lastly, the sub-study spanned summer 2020 and winter 2020. As the pandemic continues, the ongoing and dynamically unfolding effects of COVID-19 should be examined.

Conclusion

While most adolescents emerge from this developmental period with a positive sense of self, a high level of funcitioning, and a good quality of life, this is also a period when many forms of psychopathology first begin to manifest, especially when exposed to disasters and trauma. For many, it is possible that enduring mental health problems resulting from trauma exposure may be even more detrimental in the long-term than the event itself. Thus, it is important to

understand processes that contribute to varying outcomes. Although the COVID-19 pandemic represents one of the most devasting global crises in history, this experience nevertheless offers the opportunity to further our understanding of processes linked to adolescent well-being, subsequently advancing effective prevention-focused programming and informing public health recommendations. Given the salience that families and social media have on influencing adolescent attitudes and behavior, coupled with prior work demonstrating the protective role of social supports in buffering the negative effects of trauma, a focus on socialization contexts is critical. Limiting exposure to some socialization contexts, such as news coverge, while promoting alternative socialization practices (e.g., videp apps) to stay connected with family and friends may help reduce adolescent psychological distress following major community trauma.

Authors' Contributions EMT conceived of the study, performed the statistical analysis, participated in the interpretation of the data, and drafted the manuscript; NFS was involved in measurement development, participant recruitment, data collection, and helped to draft the manuscript; SAH was involved in participant recruitment, data collection, and helped to draft the manuscript; JVC was involved in measurement development, participant recruitment, data collection, and helped to draft the manuscript; JSC assisted in the design of the study, was involved in measurement development, and helped to draft the manuscript; MTS assisted in the study design and coordination of the study, participated in the interpretation of the data, and helped to draft the manuscript. All authors read and approved the final manuscript.

Data Sharing Declaration The datasets generated and/or analyzed during the current study are not yet publicly available but are available from the corresponding author on reasonable request.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethical Approval All procedures with human participants were in accordance with the ethical standards of the institutional committee where the study was conducted and with the 1964 Helsinki declaration and its later amendments.

Informed Consent Written informed consent and assent was obtained from the parents and adolescents, respectively.

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