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Top problems of adolescents and young adults with ADHD during the COVID-19 pandemic

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ABSTRACT

Objective: ADHD symptom severity appears to be exacerbated during the COVID-19 pandemic. The present study surveyed top problems experienced by adolescents and young adults (A/YAs) with ADHD during the COVID-19 pandemic to identify possible reasons for symptom escalation and potential targets for intervention. We also explored perceived benefits of the pandemic for A/YAs with ADHD.

Method: At the outbreak of the COVID-19 pandemic (April–June 2020), we administered self and parent ratings about current and pre-pandemic top problem severity and benefits of the pandemic to a sample of convenience ($N = 134$ A/YAs with ADHD participating in a prospective longitudinal study).

Results: The most common top problems reported in the sample were social isolation (parent-report: 26.7%; self-report: 41.5%), difficulties engaging in online learning (parent-report: 23.3%, self-report: 20.3%), motivation problems (parent-report: 27.9%), and boredom (self-report: 21.3%). According to parent ($d = 0.98$) and self-report ($d = 1.33$), these top problems were more severe during the pandemic than in prior months. Contrary to previous speculation, there was no evidence that pandemic-related changes mitigated ADHD severity. Multilevel models indicated that A/YAs with higher IQs experienced severer top problems exacerbations at the transition to the COVID-19 pandemic.

Conclusions: For A/YAs with ADHD, several risk factors for depression and school dropout were incurred during the early months of the COVID-19 pandemic. A/YAs with ADHD should be monitored for school disengagement and depressive symptoms during the COVID-19 pandemic. Recommended interventions attend to reducing risk factors such as increasing social interaction, academic motivation, and behavioral activation among A/YAs with ADHD.

1. Introduction

Attention Deficit/Hyperactivity Disorder (ADHD) occurs in 5–10% of youth and is characterized by impairing attention problems and hyperactivity/impulsivity (Barkley, 2014; Danielson et al., 2018). As research emerges on the impact of the Coronavirus Disease 2019 (COVID-19) pandemic on mental health, findings suggest symptom increases among youth with ADHD (Becker et al., 2020; Zhang et al., 2020). Elevated ADHD symptoms, even when time-limited, can beget risks for serious impairments such as school failure, major depression, substance abuse, and conflict with family members (Edwards et al., 2001; Kent et al., 2011; Lee et al., 2011; Meinzer et al., 2014; Sibley et al., 2020b). A looming concern for older youth with ADHD is that pandemic-related symptom exacerbations might lead to permanent negative consequences such as grade retention or dropout, legal problems, heavy substance use, or suicidal/parasuicidal behaviors (Barkley et al., 1991; Elkins et al., 2018; Hinshaw et al., 2012; Sibley et al., 2011). Research is necessary to establish the clinical needs of adolescents and

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young adults (A/YAs) with ADHD during the COVID-19 pandemic and offer empirically-informed guidelines for assessment and treatment of ADHD during this global event.

A/YAs with ADHD (versus children) may be at particular risk for experiencing pandemic-related increases in ADHD severity and/or related impairments (Becker et al., 2020; Cortese et al., 2020). For one, secondary and post-secondary students are expected to independently manage large-parcel academic work (Barber and Olson, 2004; Eccles, 2004) with minimal scaffolding from parents and teachers (Steinberg and Morris, 2001). Unlike elementary school, these academic contexts demand self-regulated learning—the ability to independently regulate one's motivational state and behavior when completing schoolwork (Zimmerman, 2002). Pandemic-related shifts to low-structure, online learning environments heighten demands for self-regulated learning by eliminating structured school routines and reducing teacher prompts, assistance, and reinforcements. With deficits in many psychological processes that support self-regulated learning (Lee and Zentall, 2017; Modesto-Lowe et al., 2013; Sonuga-Barke, 2003), A/YAs with ADHD may experience worsening symptoms as they adjust to home learning. Pandemic-related symptom exacerbations may resemble maladjustment noted when youth with ADHD transition from highly-structured elementary school to less-structured middle school (Langberg et al., 2008) and from high school to fully-unstructured college (Howard et al., 2016). If ADHD symptoms become unmanageable during the pandemic, A/YAs with ADHD may risk academic disengagement and even dropout. During the COVID-19 pandemic, adolescents with ADHD appear to experience greater problems with remote learning than peers due to difficulties concentrating, trouble maintaining a structured academic routine, and poor access to school accommodations (Becker et al., 2020).

ADHD symptoms also can be exacerbated by stress exposure (Cook et al., 2005; Hartman et al., 2019; van der Meer et al., 2017), which may come as a consequence of managing safety concerns, economic hardship, and increased family chaos during the COVID-19 pandemic (Horesh and Brown, 2020). The research on ADHD severity and stress exposure suggests that mood and conduct problems may be clinical sequelae when individuals with ADHD experience high stress levels (Hartman et al., 2019; van der Meer et al., 2017). Thus, increased stress exposure during the pandemic may contribute to pandemic-related symptom and impairment exacerbations among A/YAs with ADHD.

Finally, individuals with ADHD demonstrate vulnerabilities to the onset of serious psychiatric and behavioral health problems such as mood disorders, suicidal behavior, substance abuse, and antisocial behavior—particularly during adolescence and young adulthood (Huang et al., 2018; Meinzer et al., 2014; Sibley et al., 2011; Wilens et al., 1997). There is a concern that the pandemic may engage known mechanisms of risks and trigger initial psychiatric episodes—particularly for A/YAs with ADHD, who are vulnerable to the onset of comorbidities. For example, feelings of social isolation are a known consequence of COVID-19-related social distancing and quarantine (Courtet et al., 2020) and predicts onset of depression and suicide attempts in adolescents (Hall-Lande et al., 2007). School connectedness may decrease as students move to online learning formats (Becker et al., 2020) and is an important protective factor against adolescent substance use in youth with ADHD (Flory et al., 2011). Family conflict may increase during COVID-19 as a consequence of confinement (Behar-Zusman et al., 2020) and predicts onset of depression among adolescents with ADHD (Eadeh et al., 2017; Ward et al., 2019). Identifying emergent risk factors experienced by A/YAs with ADHD during COVID-19 confinement might guide targeted screening and prevention efforts.

The present study was designed to survey the top problems experienced by A/YAs with ADHD during the COVID-19 pandemic, the extent to which these problems were acutely exacerbated at the transition to pandemic confinement, and individual-level predictors of accelerated impairment during the pandemic. We also explored perceived benefits of the pandemic for A/YAs with ADHD. Our sample of convenience included 134 A/YAs with ADHD (ages 13–22) who were scheduled for research assessments during the COVID-19 pandemic (April to June 2020) as part of long-term follow-up of a randomized clinical trial of psychosocial treatment for adolescent ADHD (Sibley et al., 2020a). We hypothesized that top problems severity would increase from pre to peri-pandemic and that top problems reported by A/YAs with ADHD and their parents would include known risk factors (e.g., social isolation, increased family conflict, difficulties engaging with online learning) for the onset of adverse outcomes. We hypothesized greater pandemic-related top problems exacerbations would be predicted by higher family adversity, male sex, younger age, lower IQ, ADHD-Combined subtype, comorbid Oppositional Defiant Disorder (ODD), presence of an Individualized Education Plan (IEP) or Section 504 Plan, and absence of medication treatment.

2. Method

2.1. Participants

Original Sample. At baseline (2015–2018), participants ($N = 278$; ages 11–17) were incoming patients at four community agencies in a large pan-Latin American and pan-Caribbean U.S. city. They were required to meet full criteria for ADHD according to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) based on a structured diagnostic interview (Shaffer et al., 2000) and parent and teacher symptom and impairment ratings (Fabiano et al., 2006; Pelham et al., 1992) that were reviewed by two licensed psychologists on the research team. Autism spectrum disorder and intellectual disability (IQ < 70) were exclusionary. For more information about the full sample, see Sibley et al. (2020a).

Current Subsample. At the outbreak of the COVID-19 pandemic in the United States, we initiated data collection with a sample of convenience ($N = 134$) who were scheduled to participate in a wave of long-term follow-up assessments between April and June 2020. The full wave was ongoing from January to July 2020. Parent and self assessments were completed separately; an unequal number of parent ($n = 92$) and self ($n = 86$) assessments were conducted during the COVID-19 study period as this sub-study was terminated at the conclusion of the local school year (June 2020) and began midway through the scheduled data collection wave.

The 134 A/YAs (age range 13–22) with either parent or self report COVID-19 data were included in the present study. Demographic characteristics of the subsample are presented in Table 1. Slight differences between the original sample and current subsample were noted as well as differences between those with and without parent and adolescent reports in the subsample.[2] During the pandemic, 3.7% of youth attended school in person, 83.6% completed school online using a curriculum provided by the school, 0.7% completed school at home using curriculum provided by the parent, 8.2% did not participate in schooling, and 3.7% endorsed "other."

[2] Compared to the full sample ($N = 278$), the COVID-19 subsample possessed significantly higher parent education levels ($p = .037$), lower parent English proficiency ($p = .037$), and higher full-scale IQs ($p = .039$). Compared to the subsample with only teen data ($N = 48$), those with parent data ($N = 86$) were more likely to identify as Latinx ($p = .008$) and have parents with limited English proficiency ($p = .011$). Compared to the subsample with only parent data ($N = 42$), those with teen data ($N = 92$) were more likely to have a baseline ODD diagnosis ($p = .043$). These differences may reflect facilitators to scheduling follow-up appointments (i.e., parents with English proficiency and adolescents without ODD may have been easier to schedule for assessments from January–March, completing data collection wave prior to COVID-19).

Table 1
Demographic characteristics of the sample.

Average age (Mean ± sd)	17.11 ± 1.62
Average IQ (Mean ± sd)	97.25 ± 13.71
Oppositional Defiant Disorder (ODD) Diagnosis	
Yes	49.30%
No	50.70%
ADHD Symptom Count at Follow-up (Mean ± sd)	
Inattention	4.46 ± 3.23
Hyperactivity/Impulsivity	2.76 ± 2.70
ADHD Medication at Follow-up	
Yes	21.60%
No	78.40%
Sex	
Male	65.70%
Female	34.30%
Race/Ethnicity	
Latinx	85.10%
Non-White (African-American, Black, Mixed Race)	10.40%
White	4.50%
Received School Accommodations	
Yes	39.80%
No	60.20%
Parent Bachelor's Degree	52.20%
Parent Marital Status	
Single (Divorced, Never married)	30.60%
Married	69.40%
Parent English Proficiency	
Proficient	52.20%
Non-Proficient	47.80%

2.2. Procedure

All procedures were approved by the Florida International University Institutional Review Board. All participants and parents provided written informed consent and/or assent at baseline and long-term follow-up. Detailed information about the original trial is published elsewhere (Sibley et al., 2020a). Briefly, participants with ADHD were randomly assigned to receive a 10-week evidence-based psychosocial treatment protocol or usual care provided by community mental health practitioners at the agency at which they sought care. Participants in both groups were assessed at baseline, post-treatment, and follow-up (~4.70 months after post-treatment) during the acute phase of the trial.

On average, data collection for the long-term follow-up wave occurred 2.57 years (*SD* = 0.80) after study treatment concluded. Beginning in January 2020, the full sample (parents and A/YAs) were separately contacted to consent to participation and complete a long-term follow-up assessment consisting of parent and self-ratings of symptoms and impairments. Based on participant preference, assessments were administered either by online survey (47.5%) or phone (52.5%). Phone interviews were administered by carefully trained and supervised research assistants (a majority of whom were fluent in both English and Spanish). Research assistants were required to demonstrate fidelity to survey administration procedures in an analogue assessment prior to interaction with research participants. Participants received $50 for completing the follow-up assessment. Participants who were scheduled for assessment between April–June 2020 received an additional survey querying functioning during the COVID-19 pandemic.

2.3. Measures

Top Problems Assessment. A rating scale adaptation of the Top Problems (TP) assessment (Weisz et al., 2011) was administered to parents and A/YAs. Respondents were asked to list the A/YA's three "top problems" during the COVID-19 pandemic using their own words. Following indication of top problems, respondents were asked to rate the severity of each problem from 0 to 6 (lower numbers indicated lower severity). Finally, for each problem, respondents were asked to rate the severity the problem immediately before the COVID-19 pandemic using the same scale. Although the full psychometrics of the TP rating scale adaptation remain untested, the standard TP assessment demonstrates strong convergent validity with established measures of youth psychopathology (Weisz et al., 2011). A TP average score was computed as the mean severity score across all reported top problems.

To code the top problems assessment, we consulted the TP assessment coding manual (Herren et al., 2018). Based on recommendations, responses to the TP assessment were not coded if they were vague (e.g., "communication", "allergies", "I don't know") or utilized wording without a clear behavioral or emotional referent (e.g., "unable to log in to do class work", "unable to get financial assistance, "computer not working properly"). This led to the exclusion of 15 top problems noted by parents (5.4%) and 33 top problems noted by teens (12.8%); but no participant had all three top problems excluded for any rater. The resulting responses were coded using procedures by Merriam (1998). Research staff segmented responses into distinct units of data that represented the smallest possible pieces of information that were relevant to the question (i.e., when top problems included double problems). Four coders were instructed to review a unique subset of the data to create categories that were relevant, exhaustive (place all data into a category), and mutually exclusive. The coders gave each category a name that matched its content. Following independent category construction, coders compared the list of categories. The independent coders collaborated to create a final list of categories, each with an operational definition and key examples. In a final step, coders were tasked with reviewing the full set of data (two coders reviewed the parent responses and two coders reviewed the youth responses) and sorted each response using the finalized list of categories and their definitions. Coders were blind to study hypotheses during coding. Responses provided by parents in Spanish were coded by Spanish speaking coders. Twenty percent of codes were double coded to assess inter-rater reliability, which was *kappa* = .83, indicating strong agreement (McHugh, 2012).

Benefits of COVID-19. We developed a scale that mirrored the TP assessment and asked parents and teens to report on "the three top benefits that your teen is experiencing due to lifestyle changes surrounding the COVID-19 pandemic?" For each listed benefit, respondents were asked "How is this benefit impacting the teen's ADHD severity?" Response scale ranged from "-2 greatly decreasing ADHD severity" to "+2 greatly increasing ADHD severity." Benefits were coded using the process described above. Inter-rater reliability was *kappa* = .78, indicating moderate agreement (McHugh, 2012).

Predictors of Top Problem Severity. We tested eight potential predictors of top problem severity during the COVID-19 pandemic. Age (derived from birth date) and sex were measured from participant report on a standard demographic questionnaire that was administered at baseline. Current stimulant medication and presence of an IEP/Section 504 Plan were measured using a comprehensive treatment questionnaire (Kuriyan et al., 2014) administered to participants and their parents at each assessment. ADHD subtype (Predominantly Inattentive, Combined) and ODD diagnosis were measured at baseline using the diagnostic process described previously. IQ was measured at baseline using the Wechsler Abbreviated Scale of Intelligence-2nd Edition (WASI-II; Wechsler, 2011). Family adversity was measured using a cumulative risk index. We previously adapted the Rutter Family Adversity Index (Coxe et al., 2020; Rutter et al., 1975) to fit the sample context (i.e., high prevalence of immigrant families) and available data. The resulting score (0–4) equally weighed the following risk factors: (1) single parent household, (2) all parents with a high school degree or less (indicator of low socio-economic status), (3) all parents with limited English proficiency, and (4) greater than two children living in the home. Higher scores on the family adversity index indicated presence of more risk factors.

Analytic Plan. Sample moments for qualitatively coded top problems and benefits were presented descriptively. Repeated measures Analysis of Variance (ANOVA) was conducted to evaluate pre- and peri-

pandemic perceived differences in TP severity. Cohen's *d* standardized difference scores were calculated. To examine whether eight youth characteristics (e.g., family adversity, IQ) predicted changes in parents' and youths' perceived TP severity during the transition to COVID-19, multi-level models were conducted using *Mplus* 8.1. These models adjusted for the nesting of time points within individuals. First, both parent and teen-rated severity were regressed onto a time variable (0 = pre-COVID, 1 = peri-COVID) at the within-person level (Level 1). Then, each predictor was added independently at the between-person level (Level 2). A cross-level interaction was modeled to examine whether each predictor moderated the effect of time. The Johnson-Neyman method was used to probe significant interactions, which plots continuous changes in the slope between time and TP severity at differing levels of the moderator, as opposed to relying on cut-off scores, such as ± 1SD of the moderator mean (Borich and Wunderlich, 1973; Johnson and Neyman, 1936). Full Information Maximum Likelihood was used to handle missing data, with predictors of missingness (i.e., parent education, English proficiency, IQ, Latinx ethnicity, baseline ODD diagnosis) included as auxiliary variables, by estimating their variances at the between-level.

3. Results

Top Problems. Parents and A/YAs provided a range of responses to the TP assessment resulting in 14 categories of problems (see Table 2). The three most common problems reported by parents were motivation problems (27.9%), social isolation (26.7%), and difficulties engaging in online learning (23.3%). The three most common problems reported by A/YAs were social isolation (41.5%), boredom (21.3%), and difficulties engaging in online learning (20.2%). Average severity (0–6 scale) across top problems during the pandemic was 3.32 (SD = 2.22) for parent report and 2.74 (SD = 1.87) for self report. For parent report, perceived top problems severity during the pandemic significantly differed from pre-pandemic top problems severity (M = 1.72, SD = 1.64; $F(1,84)$ = 75.41, p < .001, d = 0.98). For self report, the same was true (pre-pandemic M = 1.05, SD = 1.27, $F(1,91)$ = 92.56, p < .001, d = 1.33).

Benefits. To explore whether certain functional problems improved during the pandemic, we also coded top benefits of the pandemic for A/YAs with ADHD. Parents and youth provided a range of responses to the benefits assessment resulting in 19 categories of benefits (see Table 3). The three most common benefits reported by parents were spending more time with family (43.0%), more time available to complete academic work (12.8%), and reduced anxiety (12.8%). The three most common benefits reported by A/YAs were more unstructured time to relax (39.4%), spending more time with family (29.8%), and more time available to complete academic work (21.3%). With respect to the impact of these benefits on ADHD symptom severity (−2 to +2 scale), parents reported an average benefit impact score of −0.26 (SD = 0.89) and A/YAs reported an average benefit impact score of −0.38 (SD = 0.80). These scores correspond most closely with the anchor of "0 = No Impact on ADHD severity."

Table 2
Top problems reported by adolescents and young adults with ADHD and their parents during early phase of the COVID-19 pandemic.

	Endorsed by Parents% (*n*)	Endorsed by Youth % (*n*)
Social Isolation	26.7 (23)	41.5 (39)
Difficulties Engaging in Online Learning	23.3 (20)	20.2 (19)
Motivation Problems	27.9 (24)	14.9 (14)
Boredom	8.1 (7)	21.3 (20)
Sleep Dysregulation	14.0 (12)	8.5 (8)
Concentration Problems	11.6 (10)	9.6 (9)
Organization, Time management, and Planning Problems	10.5 (9)	6.4 (6)
Anxiety	9.3 (8)	7.4 (7)
Reduced Physical Activity	5.8 (5)	9.6 (9)
Irritability	11.6 (10)	3.2 (3)
Depression	8.1 (7)	3.2 (3)
Conflict with family members	1.2 (1)	9.6 (9)
Difficulty Following Safety Guidelines	2.3 (2)	3.2 (3)

Table 3
Top benefits reported by adolescents and young adults with ADHD and their parents during early phase of the COVID-19 pandemic.

	Endorsed by Parents % (*n*)	Endorsed by Youth % (*n*)
Spending More Time with Family	43.0 (37)	29.8 (28)
More Unstructured Time to Relax	11.6 (10)	39.4 (37)
More Time Available to Complete Academic Work	12.8 (11)	21.3 (20)
Improved Sleep	11.6 (10)	17.0 (16)
Increased Self-Awareness	11.6 (10)	17.0 (16)
Reduced Anxiety	12.8 (11)	8.5 (8)
Improved Concentration	9.3 (8)	10.6 (10)
School Demands Decreased	11.6 (10)	7.4 (7)
Enjoying Staying at Home	7.0 (6)	10.6 (10)
Improved Grades	5.8 (5)	7.4 (7)
Reduced Irritability/Mood Problems	9.3 (8)	1.1 (1)
Healthier Eating Habits	1.2 (1)	7.4 (7)
Social Isolation	–	8.5 (8)
Completing More Household Tasks	5.8 (5)	3.2 (3)
Increased Social Interaction	2.3 (2)	5.3 (5)
Increased physical activity	2.3 (2)	4.3 (4)
Increased Parental Monitoring	5.9 (5)	–
Increased Health-Conscious Behaviors	4.7 (4)	1.1 (1)
Improved Finances	1.2 (1)	2.1 (2)

3.1. Predictors of escalating problems at the transition to COVID-19

In the initial model with no demographic predictors, time was a significant predictor of both self-reported and parent-reported severity indicating increased problem severity from pre to peri-pandemic. Both A/YAs (B = 1.67(0.17), p < .001) and parents (B = 1.61(0.18), p < .001) reported increases in severity during COVID-19 than prior to the pandemic. Of the 8 moderators of change in parent- or self-reported severity (see Table 4), only IQ significantly moderated the relationship between time and severity for A/YAs (B = 0.02(0.01), p = .04), but not for parents (B = 0.01(0.01), p = .73). As IQ increased, A/YAs reported higher degrees of change in severity of their top problems from pre-to peri-COVID (although the change in severity was still significant for all participants in the sample; see Fig. 1).

4. Discussion

During the early months of the COVID-19 pandemic, the most common top problems reported by our sample of A/YAs with ADHD included social isolation, motivation problems, boredom, and difficulties engaging in online learning. Parents and A/YAs perceived exacerbation in problem severity as the sample transitioned to the COVID-19 pandemic, in the absence of ameliorative effects on ADHD symptom severity. These exacerbations appeared to arise uniformly, regardless of an individual's demographic and clinical characteristics. However, A/YA's with higher IQs experienced the greatest exacerbations in self-perceived problems as they transitioned to the COVID-19 pandemic.

In the early months of the COVID-19 pandemic, most A/YAs with ADHD did not appear to experience increases in severe problem behaviors (i.e., major depression, dropout, heavy substance use, legal problems; see Table 1). Yet, as hypothesized, they demonstrated increases in several known risk factors for these adverse outcomes. The detected risk factors (i.e., social isolation, school disengagement, motivation problems, boredom) demand clinical attention given that A/YAs with ADHD are vulnerable to the negative outcomes they predict

Table 4
Predictors of top problem exacerbation during the COVID-19 pandemic.

	A/YA									Parents								
	Time Main Effect (pre-COVID = 0)			Predictor Main Effect			Time*Predictor Interaction			Time Main Effect (pre-COVID = 0)			Predictor Main Effect			Time*Predictor Interaction		
Predictors	*B*	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*	*B*	*SE*	*p*
Age	2.02	2.29	.38	0.01	0.10	.95	−0.02	0.13	.88	1.53	1.92	.43	−0.09	0.11	.41	0.01	0.11	.96
Medication (Med. = 1)	1.72	0.19	<.001	−0.12	0.35	.74	−0.25	0.40	.53	1.67	0.20	<.001	−0.15	0.30	.71	−0.27	0.46	.56
Gender (Male = 1)	1.68	0.30	<.001	−0.54	0.29	.07	−0.04	0.36	.91	2.05	0.32	<.001	0.14	0.36	.69	−0.61	0.38	.11
Risk Index	1.89	0.26	<.001	−0.03	0.10	.79	−0.15	0.15	.30	1.78	0.30	<.001	0.01	0.15	.92	−0.11	0.16	.48
IEP (IEP = 1)	1.75	0.21	<.001	0.26	0.19	.18	−0.16	0.20	.42	1.66	0.24	<.001	0.10	0.24	.69	−0.07	0.23	.78
ADHD (ADHD-C = 1 ADHD- PI = 0)	1.75	0.23	<.001	0.10	0.27	.71	−0.18	0.34	.61	1.92	0.26	<.001	−0.37	0.35	.29	−0.60	0.35	.09
Comorbid ODD (ODD = 1)	1.81	0.27	<.001	0.53	0.26	.05	−0.26	0.34	.44	1.46	0.25	<.001	0.56	0.35	.10	0.35	0.37	.34
IQ	−0.50	1.09	.64	0.00	0.01	.79	0.02	0.01	.04	1.17	1.26	.35	−0.01	0.02	.49	0.01	0.01	.73

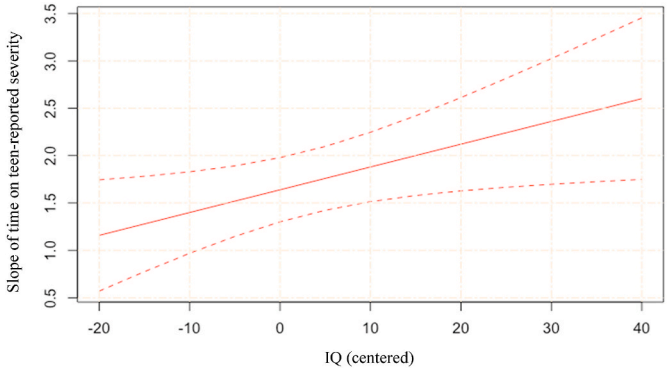

Fig. 1. Johnson-Neyman Plot outlining the change in slope between time and teen-reported top problem severity at increasing levels of IQ (solid red line) and confidence intervals (dotted lines). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

(Barkley et al., 1991; Elkins et al., 2018; Hinshaw et al., 2012; Sibley et al., 2011). Our data was collected in the early pandemic months; based on emergent risk factor in this sample, we hypothesize that late-pandemic assessments of A/YAs with ADHD will detect increases in serious adverse outcomes relative to A/YAs without ADHD.

In particular, when an A/YA with ADHD experiences social isolation, boredom, motivation problems, and/or school disengagement during the COVID-19 pandemic, they may experience a perfect storm of risk factors for major depression and school dropout. Considering both parent and self reports, negative effects of social isolation were noted in nearly half the sample (particularly by self-report) and boredom in nearly a third. Social isolation is a critical mechanism of depression onset among youth (Hall-Lande et al., 2007). Because A/YAs with ADHD demonstrate difficulties initiating social interactions and maintaining friendships outside of school, they may primarily experience social interactions in school (Bagwell et al., 2001; Ros and Graziano, 2020). As a result, they may be more vulnerable to social isolation when transitioning to home learning. Boredom proneness is associated with attention problems (Harris, 2000; Malkovsy et al., 2012) making this mental state an unsurprising sequalae of the COVID-19 pandemic for A/YAs with ADHD. Like social isolation, chronic boredom is associated with depression onset (Spaeth et al., 2015; van Hoof and van Hooft, 2016). Taken together, these findings may suggest that remote learning could be contraindicated for A/YAs with ADHD, who rely on in-person school experiences for social interactions and optimal engagement in academics.

Motivation problems mediate the relationship between ADHD and school performance (Lee et al., 2012)—in our sample, motivation difficulties may directly manifest as difficulties engaging in remote learning. A concern remains that characteristically tenuous school engagement among adolescents with ADHD (Zendarski et al., 2017) may snowball in the context of remote learning and lead to premature dropout (Becker et al., 2020). Heterogeneity in reported top problems indicated that the COVID-19 pandemic also bestowed a wide variety of challenges to individual A/YAs with ADHD such as sleep dysregulation, anxiety, and reduced physical activity, each of which contributed to the large exacerbations in peri-pandemic top problems reported in the sample (d = 0.98 to 1.33).

Some speculate that COVID-19 pandemic-related changes may improve ADHD symptoms by introducing flexible schedules and greater personal space and tranquility during home learning compared to school (Bobo et al., 2020). In the present sample, parents and A/YAs reported pandemic-related benefits that included spending more time with family, increased relaxation time, and more time to complete academic work (see Table 2). However, there was no evidence that these benefits impacted ADHD symptom severity in a meaningful way. Still, it is possible that downstream effects of benefits might buffer negative consequences of risks. For example, closer family relationships may mitigate depression risk among A/YAs with ADHD (Ward et al., 2019). Mastering remote learning environments in high school may ready adolescents with ADHD for shifts to independent learning in college. On the other hand, downstream effects of pandemic-related problems (i.e., missing social interactions that are critical to adolescent identity development; O'Brien and Bierman, 1988) may be more prominent. The moderating effects of perceived problems and benefits on post-pandemic outcomes should be investigated in future research. We also note that some parent-perceived problems (i.e., sleeping during the day, too much relaxation time) were viewed as benefits to A/YAs (i.e., more lenient sleep schedules, more time to relax). Future work should investigate the role of self-perception differences in predicting longitudinal trajectories among individuals with ADHD.

Surprisingly, the subgroup at highest risk for COVID-19 pandemic-related top problems exacerbations were youth with high IQs. Although some research suggests that individuals with ADHD and high IQs demonstrate more persistent forms of the disorder (de Zeeuw et al., 2012), most work suggests that high IQ mitigates ADHD severity and promotes positive prognoses (Cheung et al., 2015; Mahone et al., 2002). Post-hoc analyses indicated that higher IQ was significantly associated with report of higher family conflict during the COVID-19 pandemic (r = 0.230; p = .026); thus, higher conflict may be a mechanism of greater problem exacerbations among high IQ A/YAs with ADHD during the COVID-19 pandemic. Gifted A/YAs with ADHD may also experience particularly high academic demands that may be more challenging to self-manage during the shift to remote learning. In support of this possibility, Duraku and Hoxha (2020) reported that sleep disturbances and negative emotions increased in gifted high school students during the

COVID-19 pandemic. Further research is needed to understand the mechanisms by which the COVID-19 pandemic may be particularly challenging for individuals with ADHD and high IQs.

The limitations of this study include our sample of convenience, which may inadequately represent the full population of adolescents with ADHD (e.g., adolescents with comorbid Autism Spectrum Disorder, European-American adolescents, adolescents receiving stimulant medication, adolescents with severe ADHD symptoms), or the full participant pool from which the current sample was drawn. In addition, report of pre-pandemic functioning required retrospective recall of up to three months. Retrospective reporting is more prone to reporting errors than prospectively collected data. Some predictor variables (e.g., ADHD subtype, IQ) were measured at baseline (~three years prior to COVID-19). Though stability in these variables over time is expected, it is possible that changes in these variables that occurred in the study's follow-up period were not reflected in our analyses. Our analyses included A/YAs in middle school, high school, and college academic environments; although we found no effects of age on outcomes, future work with larger samples is needed to understand how school setting may influence the effects herein. We did not include a non-ADHD comparison group in this study, which would have elucidated whether study findings were specific to ADHD. Because participants completed TP assessments in a survey format, responses were not screened for acceptability at the time of administration. Although no informant had all three of their top problems excluded, our procedure led to the exclusion of 5.4% of parent responses and 12.8% of A/YA responses. Thus, some participant average TP scores were based on less than three top problems. We also did not ask respondents to name their three top problems immediately prior to the pandemic. Thus, we are unable to conclude whether pre-pandemic top problems got worse, or whether new top problems leapfrogged the old in severity. Finally, we did not collect pre-pandemic ADHD symptom ratings that would have facilitated mediational models that directly test whether pandemic-related exacerbations in top problems are a mechanism of ADHD symptom escalations.

5. Conclusions

Based on our findings, we offer several clinical recommendations for ADHD treatment during the COVID-19 pandemic. First, youth with ADHD should be regularly monitored for depression and school avoidance, as well as risk factors that may indicate these difficulties could be forthcoming (e.g., social isolation, boredom, motivation difficulties, sleep problems, disengagement from online learning). Second, adolescent engagement in remote learning is a clear priority for treatment during the pandemic. Stimulant medication may be instrumental in promoting academic engagement (Evans et al., 2001; Pelham et al., 2017) with medium to large effects on ADHD symptoms reported in the A/YA age group (Findling et al., 2011; Wilens et al., 2006). In accordance with existing COVID-19 guidelines (CADDRA, 2020; Cortese et al., 2020), practitioners are encouraged to confirm that patient ADHD medications are appropriately titrated during the pandemic. Clinical treatment of ADHD during the COVID-19 pandemic should also include a focus on creating socially rewarding peer interactions in a virtual or socially distant manner. Some research suggests that one-to-one peer activities may be more beneficial to youth with ADHD and social problems than group peer activities (Ros and Graziano, 2020). Psychosocial interventions for adolescent ADHD that specifically address motivation problems (i.e., Plan My Life, Boyer et al., 2015; Supporting Teens' Autonomy Daily; STAND; Sibley et al., 2016) may be particularly appropriate during the pandemic and can be successfully delivered via telehealth (Sibley et al., 2017). For maximal impact, utilizing combined treatment approaches may be especially appropriate for adolescents and young adults with ADHD during the COVID-19 pandemic. We anticipate that many of these recommendations will remain relevant post-pandemic—particularly for A/YAs with ADHD who engage in remote learning.

CRediT authorship contribution statement

Margaret H. Sibley: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing - original draft. **Mercedes Ortiz:** Data curation, Formal analysis, Investigation, Project administration, Writing - review & editing. **Larissa M. Gaias:** Conceptualization, Formal analysis, Writing - review & editing. **Rosemary Reyes:** Formal analysis, Writing - review & editing. **Mahima Joshi:** Formal analysis, Writing - review & editing. **Dana Alexander:** Formal analysis, Writing - review & editing. **Paulo Graziano:** Conceptualization, Investigation, Methodology, Writing - review & editing.

Declaration of competing interest

The authors report no conflicts of interest related to this research.

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