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Cyberbullying and Sleep Disturbance among Early Adolescents in the U.S.

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Abstract

Objective: To determine the association between cyberbullying (victimization and perpetration) and sleep disturbance among a demographically diverse sample of 10-14-year-old early adolescents.

Methods: We analyzed cross-sectional data from the Adolescent Brain Cognitive Development (ABCD) Study (Year 2, 2018–2020) of early adolescents (10–14 years) in the U.S. Modified Poisson regression analyses examined the association between cyberbullying and self-reported and caregiver-reported sleep disturbance measures.

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Results: In a sample of 9,443 adolescents (mean age 12.0 years, 47.9% female, 47.8% white), 5.1% reported cyberbullying victimization, and 0.5% reported cyberbullying perpetration in the past 12 months. Cyberbullying victimization in the past 12 months was associated with adolescent-reported trouble falling/staying asleep (risk ratio [RR] 1.87, 95% confidence interval [CI] 1.57, 2.21) and caregiver-reported overall sleep disturbance of the adolescent (RR: 1.16 95% CI 1.00, 1.33), in models adjusting for sociodemographic factors and screen time. Cyberbullying perpetration in the past 12 months was associated with trouble falling/staying asleep (RR 1.95, 95% CI 1.21, 3.15) and caregiver-reported overall sleep disturbance of the adolescent (RR: 1.49, 95% CI 1.00, 2.22).

Conclusions: Cyberbullying victimization and perpetration are associated with sleep disturbance in early adolescence. Digital media education and counseling for adolescents, parents, teachers, and clinicians could focus on guidance to prevent cyberbullying and support healthy sleep behavior for early adolescents.

Keywords

Cyberbullying; screen time; adolescent; sleep; sleep disturbance

Introduction

Screen use among children and adolescents has increased and transformed over the past few years with new social media and digital technology devices and platforms (e.g., smart phones, gaming consoles, tablets), which has led to more potential exposure to cyberbullying victimization and perpetration.[1] Cyberbullying is the willful and repeated harm by a perpetrator to a victim through the use of computers, cell phones, or other electronic devices.[2] Cyberbullying is recognized as a serious public health issue affecting children and adolescents, and there is a critical need to understand health consequences of cyberbullying.[3] More screen usage has been shown to be associated with poorer sleep outcomes,[4] yet there is a relative lack of studies examining the potential relationship between cyberbullying and sleep.

Traditional bullying has been shown to be associated with poor sleep, and poor sleep may increase the risk for criminal activities and psychiatric disorders.[5] One study of a cohort of Portuguese students aged 11 to 16 years reported that traditional bullying is associated with higher insomnia, especially among the victims of bullying.[5] Similarly, prior studies have found associations between cyberbullying and sleep problems among adolescents in Finland,[6] Canada,[7] and from a single high school in the northeastern U.S.[8] There is however a paucity of data focusing on early adolescence, a critical developmental period when cyberbullying behaviors may develop. For instance, the age of permissible use for most social media platforms is 13 years, although robust age verification is not required, and social media use generally increases from early to late adolescence.[9] Furthermore, there is a need to investigate this relationship at a national level in the U.S.

The current study aimed to investigate associations between contemporary cyberbullying behaviors (victimization and perpetration) and sleep disturbance across a nationally demographically diverse sample of early adolescents aged 10–14 years old in the U.S.

We hypothesized that increased cyberbullying victimization and perpetration would be associated with sleep problems.

Methods

Cross-sectional data from 2-year follow-up of the Adolescent Brain Cognitive Development (ABCD) study (4.0 release) were analyzed. The ABCD study is a longitudinal study (baseline 2016–2018) of health, brain, and cognitive development in 11,875 children from 21 recruitment sites across the U.S. Study participants, recruitment, protocol, and measures have previously been described in detail.[10] Participants were predominantly 11–12 years old (range 10–14 years) during the 2-year follow-up, which was conducted between 2018–2020. We excluded participants with missing cyberbullying or sleep data, leaving 9,443 adolescents in this analysis (Appendix A). Institutional review board (IRB) approval was received from the University of California, San Diego and the respective IRBs of each study site. Written assent was obtained from participants, and written informed consent was obtained from their caregivers.

Measures

Predictors

Cyberbullying Questionnaire.—Adolescents completed a self-reported questionnaire to capture cyberbullying (victimization and perpetration) based on the validated Cyberbullying Scale.[3,11,12] Cyberbullying victimization was assessed with the question, “Have you ever been cyberbullied, where someone was trying on purpose to harm you or be mean to you online, in texts, or group texts, or on social media (like Instagram or Snapchat)?” Cyberbullying perpetration was assessed with the question, “Have you ever cyberbullied someone, where you purposefully tried to harm another person or be mean to them online, in texts or group texts, or on social media (like Instagram or Snapchat)?” For both cyberbullying victimization and perpetration, participants were also asked if this occurred in their lifetime, as well as in the past 12 months.

Outcomes

Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS) DSM-5 Sleep Outcomes.—Adolescents were asked “In the past two weeks, how often did you have trouble falling asleep or staying asleep when you were tired and wanted to sleep?” adapted from the KSADS DSM-5 survey,[13] a psychiatric diagnostic assessment tool for school-aged children. Responses were given on a 5-point Likert type scale, which were dichotomized into two categories (those having a problem at least several days in the past 2 weeks versus those having a problem rarely or never).

Sleep Disturbance Scale for Children (SDSC).—A 26-item measure was administered to the caregivers of the adolescent to assess for overall sleep disturbance and sleep problems including disorders of initiating and maintaining sleep, sleep breathing disorders, disorders of arousal/nightmares, sleep-wake transition disorders, disorders of excessive somnolence, and sleep hyperidrosis. Responses to each item were given on a

5-point Likert scale ranging from 1 (never) to 5 (daily). A cutoff of 39 was used to indicate that a child had more sleep disturbance.[14] Cronbach's alpha for the SDSC was 0.83 in this sample indicating good internal consistency.

Confounders

Sex (female, male), race and ethnicity (White, Latino/Hispanic, Black, Asian, Native American, other), and study site (n = 21) were recorded at baseline. Age (years), household income (greater or less than 75,000 U.S. dollars based on the approximate median U.S. household income), and highest parent education (high school or less vs. college or more) were recorded at Year 2 by the caregiver. Total recreational screen time was based on the sum of adolescents' self-reported hours of eight different screen modalities on a typical weekday and weekend at Year 2.[15] Total daily screen use was calculated as the weighted sum ([weekday average x 5] + [weekend average x 2])/7. Potential confounders for the association between cyberbullying and sleep outcomes were selected based on previous literature.[6–8]

Statistical Analyses

Data analysis was performed in 2022 using Stata 15.1 (StataCorp, College Station, TX). Multiple modified Poisson regression analyses using robust standard errors were conducted to calculate risk ratios (RR) estimating associations between cyberbullying victimization and perpetration (exposure variables) and sleep problems and disturbance (outcome variables). For each analysis, we report three models: Model 1: unadjusted; Model 2: adjusted for sociodemographic variables; Model 3: adjusted for sociodemographic variables and screen time. We selected the modified Poisson regression approach using robust standard errors for the main analysis, as it has shown to be a reliable approach to estimate relative risk compared to logistic regression.[16] Propensity weights were applied to yield representative estimates based on the American Community Survey from the US Census.[17]

Results

In a population of 9,443 early adolescents (mean age 12.0 years, 47.9% female, 47.8% white), 5.1% had experienced cyberbullying victimization in the past 12 months (Table 1). Overall, 0.5% of early adolescents had experienced cyberbullying perpetration in the past 12 months. Nearly one-sixth (15.2%) of the adolescents admitted to trouble falling or staying asleep at least several times in the past two weeks, and 26.6% had caregiver-reported overall sleep disturbance. The correlation between the caregiver- and adolescent-reported sleep measures was very weak ($r=0.09$, $p<0.001$). Total recreational screen time was higher among cyberbullying victims compared to non-victims and cyberbullying perpetrators vs. non-perpetrators (Table 2).

Table 3 shows the associations between cyberbullying and sleep outcomes. Cyberbullying victimization in the past 12 months was associated with adolescent-reported trouble falling or staying asleep and caregiver-reported sleep disturbance of the adolescent in all models, whether unadjusted (Model 1), adjusted for sociodemographic factors (Model 2), or adjusted for sociodemographic factors and screen time (Model 3). In models adjusted

for sociodemographic factors and screen time (Model 3), cyberbullying victimization was associated with a 1.87 (95% CI 1.57, 2.21) higher risk for trouble falling/staying asleep and a 1.16 (95% CI 1.00, 1.33) greater risk of overall sleep disturbance.

Cyberbullying perpetration in the past 12 months was associated with adolescent-reported trouble falling or staying asleep and caregiver-reported sleep disturbance of the adolescent in unadjusted models (Model 1), models adjusted for sociodemographic factors (Model 2), and models adjusted for sociodemographic factors and screen time (Model 3). In models adjusted for sociodemographic factors and screen time, cyberbullying perpetration was associated with trouble falling/staying asleep (RR 1.95, 95% CI 1.21, 3.15) and overall sleep disturbance (RR 1.49, 95% CI 1.00, 2.22).

Discussion

In this demographically diverse, contemporary sample of 10-14-year-old early adolescents in the U.S., we found that participants who experienced cyberbullying victimization and perpetration reported at least several days of trouble falling/staying asleep in the past two weeks. Based on the caregiver's report, cyberbullying victimization and perpetration were also associated with adolescent sleep disturbance, but findings were attenuated when adjusting for screen time.

Our results confirm prior literature demonstrating a relationship between cyberbullying and sleep disturbance,[6–8] but build upon those findings by analyzing a demographically diverse national sample from the U.S. and focusing on early adolescence, a critical developmental period when exposure to cyberbullying may first occur. There could be multiple reasons why cyberbullying victimization is associated with poor sleep, including psychological effects of cyberbullying, such as anxiety, depression, stress, and self-esteem deterioration, all of which may be associated with poor sleep.[18,19] Furthermore, as we also show in this dataset, cyberbullying victims spend more time online or on screens,[3] which could further exacerbate sleep disturbance. Although we still found effects when considering total screen use in the models, they were slightly attenuated, implying that spending more time on screens contributed to the association. More time spent on screens especially in the late evening before bedtime can be engaging and could delay sleep onset.[20] Also, blue-light-induced suppression of melatonin, a hormone that regulates circadian rhythms, could cause phase-shifting in the circadian clock, leading to sleep disturbances and increased sleep latency.[21]

Cyberbullying perpetration was similarly associated with greater trouble falling asleep and staying asleep, which could be linked through similar mechanisms including depression, anxiety, stress, and greater screen use.[3,18,19] In addition, cyberbullying perpetrators may experience counterfactual emotions such as shame, regret, and guilt, which would lead to sleep disturbance.[22] Schmidt and colleagues document that those counterfactual emotions are preferentially processed in the bedtime window, which may result in emotional arousal leading to sleep interference.

Overall, there were stronger associations between cyberbullying and adolescent-reported trouble falling or staying asleep than with the caregiver-reported sleep disturbance scale. Caregivers may not be as attuned to the adolescents' subjective experiences of difficulty falling or staying asleep. Also, the Sleep Disturbance Scale[14] measures several sleep disturbance domains compared to the single-item question asked of the adolescent, which may account for the low correlation between the two measures. Cyberbullying may be less related to some of the sleep disorders measured in the Sleep Disturbance Scale, such as disorders of excessive somnolence or sleep breathing disorders, which may additionally account for the weaker associations with this measure.

There are several strengths and limitations worth noting. The large, diverse, and population-based sample is a major strength, which gives the study greater external validity. To our knowledge, no other research has evaluated cyberbullying and sleep outcomes in a national U.S. sample focused on early adolescents. The limitations include the cross-sectional study design precluding causal relationships, and residual confounders may exist. Due to sleep behaviors being asked about retrospectively, the sample is also vulnerable to recall bias. However, we included sleep measures from both adolescents and their caregivers. Due to the small sample sizes of cyberbullying perpetrators, we were unable to analyze participants who experienced both perpetration and victimization. Given that a higher proportion of racial/ethnic minority, low-income, and low parent education adolescents were excluded from the analysis, selection bias may affect results and generalizability.

This study represents an advancement in our understanding of the potential health consequences of cyberbullying among early adolescents, focusing on sleep disturbance. Our findings could inform adolescents' adaptation and implementation of digital technology and cyberbullying guidance. The American Academy of Pediatrics advocates for a family media use plan,[23] which could incorporate guidance on family discussions on cyberbullying, including supporting adolescents at risk for cyberbullying victimization and the sleep consequences of cyberbullying. Caregivers can also monitor their child's screen use, regulate hours of use, and implement rules regarding screen use in the bedroom at bedtime as part of the family media use plan. Pediatricians may consider assessing for cyberbullying and sleep disturbances and provide support and guidance for early adolescents[24] as appropriate in this important period for development and intervention. Future research could investigate mechanisms linking cyberbullying to sleep disturbances and develop guidance and interventions to reduce cyberbullying, especially around bedtime.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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investigators.html. ABCD consortium investigators designed and implemented the study and/or provided data but did not necessarily participate in analysis or writing of this report.

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What's New

In a demographically diverse, contemporary sample of 10-14-year-old early adolescents in the U.S., cyberbullying victimization was associated with trouble falling/staying asleep and sleep disturbance. Cyberbullying perpetration was also associated with trouble falling/staying asleep and sleep disturbance.

Table 1.

Sociodemographic and cyberbullying characteristics of Adolescent Brain Cognitive Development (ABCD) Study participants (N=9,443)

Sociodemographic characteristics	**Mean (SD) / %**
Age (years), Year 2	12.00 (0.66)
Sex, baseline (%)	
Female	47.9%
Male	52.1%
Race and ethnicity, baseline (%)	
White	52.2%
Latino / Hispanic	17.2%
Black	20.2%
Asian	6.0%
Native American	3.5%
Other	0.9%
Household income, Year 2 (%)	
Less than $75,000	37.7%
$75,000 and greater	62.3%
Parents' highest education, Year 2 (%)	
High school education or less	13.5%
College education or more	86.5%
Total recreational screen time (hours per day), Year 2[a]	7.26 (7.59)
Cyberbullying, Year 2	
Cyberbullying victimization, past 12 months (%)	
No	94.9%
Yes	5.1%
Cyberbullying perpetration, past 12 months (%)	
No	99.5%
Yes	0.47%
Sleep Outcomes, Year 2	
Trouble falling/staying asleep in past two weeks[b] (%)	
No	84.8%
Yes	15.2%
Overall sleep disturbance (%), Year 2[c] (%)	
No	73.5%
Yes	26.6%

ABCD propensity weights were applied based on the American Community Survey from the US Census. SD = standard deviation

[a] Weighted sum for weekdays and weekends.

[b] Adolescent-reported sleep problems at least several times in the past 2 weeks.

[c] Caregiver-reported score of >39 on the Sleep Disturbance Scale.

Table 2.

Total recreational screen time comparisons by cyberbullying victimization and perpetration.

	Total recreational screen time (hours per day)	p[a]
Cyberbullying	**Mean (SD)**	
Cyberbullying victimization, past 12 months		
No	6.91 (7.42)	<0.001
Yes	10.21 (8.31)	
Cyberbullying perpetration, past 12 months		
No	7.08 (7.49)	<0.001
Yes	12.98 (10.20)	

ABCD propensity weights were applied based on the American Community Survey from the US Census. SD = standard deviation

[a] p from independent samples t-test

Table 3.

Associations Between Cyberbullying Items and Sleep Disturbance Outcomes in the Adolescent Brain Cognitive Development (ABCD) Study (n = 9,443)

	Trouble Falling or Staying Asleep in Past Two Weeks, Adolescent Report RR	Overall Sleep Disturbance, Caregiver Report RR
Model 1: Unadjusted		
Cyberbullying victimization, last 12 months	1.98 (1.69, 2.32)	1.21 (1.06, 1.38)
Cyberbullying perpetration, last 12 months	1.94 (1.21, 3.11)	1.31 (1.17, 1.45)
Model 2: Adjusted for sociodemographics *		
Cyberbullying victimization, last 12 months	1.97 (1.67, 2.33)	1.20 (1.04, 1.38)
Cyberbullying perpetration, last 12 months	2.21 (1.36, 3.59)	1.55 (1.06, 2.28)
Model 3: Adjusted for sociodemographics and screen time †		
Cyberbullying victimization, last 12 months	1.87 (1.57, 2.21)	1.16 (1.00, 1.33)
Total recreational screen time	1.02 (1.01, 1.03)	1.01 (1.01, 1.01)
Cyberbullying perpetration, last 12 months	1.95 (1.21, 3.15)	1.49 (1.00, 2.22)
Total recreational screen time	1.02 (1.01, 1.03)	1.01 (1.01, 1.01)

RR indicates risk ratio.

Models represent the abbreviated output from Poisson regression models transformed to risk ratios. Propensity weights from the Adolescent Brain Cognitive Development Study were applied based on the American Community Survey from the US Census.

* Model 2 adjusted for age, sex, race and ethnicity, household income, parent education, and study site.

† Model 3 adjusted for age, sex, race and ethnicity, household income, parent education, study site, and total recreational screen time.