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BRIEF REPORT

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Cyberbullying and eating disorder symptoms in US early adolescents

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Abstract

Objective: The objective of this study was to determine the association between cyberbullying and eating disorder symptoms in a national sample of 10–14-year-old early adolescents.

Method: We analyzed cross-sectional data from the Adolescent Brain Cognitive Development (ABCD) Study (Year 2, 2018–2020, $N = 10{,}258/11{,}875$, 49% female, 46% non-White). Data were collected using multi-stage probability sampling. Modified Poisson regression analyses examined the association between cyberbullying and self-reported eating disorder symptoms based on the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5).

Results: Cyberbullying victimization was associated with worry about weight gain (prevalence ratio [PR] 2.41, 95% confidence interval [CI] 1.48–3.91), self-worth tied to weight (PR 2.08, 95% CI 1.33–3.26), inappropriate compensatory behavior to prevent weight gain (PR 1.95, 95% CI 1.57–2.42), binge eating (PR 1.95, 95% CI 1.59–2.39), and distress with binge eating (PR 2.64, 95% CI 1.94–3.59), in models adjusting for potential confounders. Cyberbullying perpetration was associated with worry about weight gain (PR 3.52, 95% CI 1.19–10.37), self-worth tied to weight (PR 5.59,

Chloe M. Cheng and Jonathan Chu contributed equally to the study.

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95% CI 2.56–12.20), binge eating (PR 2.36, 95% CI 1.44–3.87), and distress with binge eating (PR 2.84, 95% CI 1.47–5.49).

Discussion: Cyberbullying victimization and perpetration in early adolescence are associated with eating disorder symptoms. Clinicians may consider assessing for cyberbullying and eating disorder symptoms in early adolescence and provide anticipatory guidance.

Public Significance Statement: Eating disorders often onset in adolescence and have among the highest mortality rates of any psychiatric disorder. In addition, cyberbullying has increased in prevalence among adolescents and significantly impacts mental health. In a national study of early adolescents, we found that cyberbullying victimization and perpetration are associated with eating disorder symptoms. Screening for and providing anticipatory guidance on cyberbullying and eating disorder symptoms in early adolescents may be warranted.

KEYWORDS

adolescent, binge eating, compensatory behavior, cyberbullying, eating disorder, perpetration, victimization, weight

1 | INTRODUCTION

Cyberbullying is a serious public health issue due to its increasing prevalence among adolescents and its impact on adolescent mental health (John et al., 2018; Kwan et al., 2020), including disordered eating behaviors (Marco & Tormo-Irun, 2018; Wang et al., 2022). Cyberbullying is defined as "an aggressive, intentional act carried out by a group or individual, using electronic forms of contact, repeatedly and over time against a victim who cannot easily defend him or herself" (Smith et al., 2008, p. 376). In particular, both victims and perpetrators of cyberbullying report greater mental health problems compared to uninvolved youth (Marciano et al., 2020). In early adolescence, screen time usage increases at the greatest rate (Twenge & Campbell, 2018), and cyberbullying is most prevalent (Kennedy, 2021), with around 1 in 5 early adolescents in the United States reporting cyberbullying involvement (Patchin & Hinduja, 2022).

Eating disorders often onset in adolescence (Curzio et al., 2015) and have among the highest mortality rate of any psychiatric disorder (Arcelus et al., 2011; Birmingham et al., 2005; Hoang et al., 2014). Eating disorder symptoms include self-induced weight loss (e.g., inappropriate compensatory behavior to prevent weight gain), intense fear of gaining weight, self-worth tied to weight, binge eating, and distress with binge eating (American Psychiatric Association, 2013). These symptoms are risk factors for the development and maintenance of full threshold eating disorders, and thus represent an important area for research and intervention (Curzio et al., 2018; Walsh, 2011).

Cyberbullying frequently centers on body appearance and weight (Cassidy et al., 2009). Studies have shown that, in turn, weight-based victimization can negatively affect adolescents' physical and mental health, increasing the risk of binge eating, unhealthy weight control behaviors, and low self-esteem (Puhl et al., 2013). A cross-sectional analysis of 2017 survey data collected from a representative sample of students in grades 9–12 found that cyberbullying victimization was associated with unhealthy weight control behaviors (Pistella et al., 2019), and another cross-sectional study utilizing data from the 2013 Ontario Student Drug Use and Health Survey found a dose–response relationship between cyberbullying victimization and breakfast-skipping behavior in adolescents aged 11–19 (Sampasa-Kanyinga & Willmore, 2015). In addition, a recent longitudinal study found that self-objectification mediated the association between cyberbullying victimization and restrained eating (Wang et al., 2022). Over time, low self-esteem, body image dissatisfaction, and unhealthy weight control behaviors may lead to the development of eating disorders (Marco et al., 2018; Marco & Tormo-Irun, 2018).

Similarly, previous studies have shown that cyberbullying perpetration has been related to decreased self-esteem and increased risk for mental health issues, including depression and anxiety (Nixon, 2014). This decrease in self-esteem and increase in depression and anxiety may predispose perpetrators to the development of eating disorder symptomatology (Sander et al., 2021).

The current literature on cyberbullying has focused on disordered eating behaviors instead of specific eating disorder symptoms as defined by the Diagnostic and Statistical Manual, 5th Edition (DSM-5) (American Psychiatric Association, 2013), concentrated on cyberbullying victimization instead of perpetration, and primarily focuses on older adolescents and young adults (Marco et al., 2018; Olenik-Shemesh & Heiman, 2017; Pistella et al., 2019; Puhl et al., 2013; Sampasa-Kanyinga & Willmore, 2015; Wang et al., 2022). Yet, previous research has shown that the largest increase in eating disorder symptoms starts in early adolescence (Breton et al., 2022). One study of early adolescents showed that cyberbullying victimization was associated with cyberbullying perpetration, body image dissatisfaction, and dieting behaviors to lose weight (Ramos Salazar, 2021).

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However, to date, no studies have used large, diverse samples examining the association between cyberbullying and DSM-5 eating disorder symptoms in early adolescents.

The purpose of this study was to determine associations between cyberbullying behaviors (victimization and perpetration) and DSM-5 eating disorder symptoms in a national, demographically diverse, contemporary sample of US early adolescents. We hypothesized that cyberbullying victimization and perpetration would be associated with eating disorder symptoms in US early adolescents.

2 | METHODS

2.1 | Study sample

We conducted a secondary cross-sectional data analysis from the 2-year follow-up of the Adolescent Brain Cognitive Development (ABCD) study, a longitudinal study (baseline 2016–2018) of brain development and health in 11,875 children recruited from 21 sites around the United States. The ABCD study design has previously been described in detail (Dick et al., 2021; Garavan et al., 2018). Data analyzed in the present study are from the ABCD 4.0 release for the Year 2 (2018–2020) assessments, with a mean participant age of 12-years-old. Evaluation of cyberbullying was only performed at the Year 2 assessment, thus, limiting the present study to a cross-sectional analysis. Participants with missing data for cyberbullying and eating disorder symptoms were excluded ($N = 1617$, 13.6%), leaving 10,258 children in the remaining analytic sample. Centralized institutional review board (IRB) approval was obtained from the University of California, San Diego. Study sites obtained approval from their respective IRBs. Participants provided written assent, and caregivers provided written informed consent.

2.2 | Independent variable: Cyberbullying

At the 2-year follow-up, adolescents completed a self-reported questionnaire to capture lifetime cyberbullying (victimization and perpetration) using a modified version of the validated Cyberbullying Scale (Barch et al., 2021; Stewart et al., 2014). 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)?" Participants answered either "yes" or "no," and those who responded "yes" were coded as either experiencing victimization or perpetration, respectively (Nagata et al., 2022). Participants were not asked about cyberbullying at the baseline assessment. Further details regarding the assessment of cyberbullying may be found in Table S1.

2.3 | Dependent variable: Symptoms of eating disorders

The ABCD study utilizes the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5), a widely used computerized tool for categorizing child and adolescent mental health concerns based on the DSM-5, for assessment of eating disorder symptoms at the 2-year follow-up (Townsend et al., 2020). The KSADS-5 assessed the frequency, duration, and characteristics of eating disorder symptoms. Participants were asked, "Do you feel like your self-worth is tied to your weight?" and "In the past two weeks, how often have you been preoccupied with your weight or worrying a lot about being fat?" Participants were also asked about behaviors such as compensatory behaviors to lose weight, binge eating, and distress with binge eating. Compensatory behaviors included the following: only eating foods with minimal calories, exercising a lot, throwing up, and taking water pills, laxatives, or diet pills. Given the low prevalence of these behaviors in the study sample, those who responded yes to any of the behaviors were coded as engaging in compensatory behaviors to lose weight. Further details regarding the assessment of eating disorder symptoms may be found in Table S2.

2.4 | Confounders

Potential confounders include sex (female, male), race/ethnicity (White, Latino/Hispanic, Black, Asian, Native American, other), household income (grouped into six categories reflecting the US median household income: less than $25,000, $25,000 through $49,999, $50,000 through $74,999, $75,000 through $99,999, $100,000 through $199,999, $200,000 and greater), and years of parent education. In addition, in order to account for potential regional variation, ABCD study site was included as a confounder.

2.5 | Statistical analysis

Data analyses were conducted on Stata 15.1 (StataCorp). Modified Poisson regression analyses with robust standard errors were used to calculate prevalence ratios estimating associations between lifetime cyberbullying as the independent variable and the presence of youth-reported eating disorder symptoms (worry about weight gain, self-worth tied to weight, inappropriate compensatory behavior to prevent weight gain, binge eating, and distress with binge eating) as the dependent variable, adjusting for confounders (Zou, 2004). Finally, propensity weights were applied based on the US Census American Community Survey to yield representative estimates (Heeringa & Berglund, 2020).

3 | RESULTS

Table 1 reports the descriptive characteristics of the 10,258 participants included in the study. The analytic sample was approximately

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TABLE 1 Sociodemographic factors and prevalence of cyberbullying and eating disorder symptoms among 10,258 Adolescent Brain Cognitive Development (ABCD) Study participants.

Sociodemographic characteristics (baseline)	Mean (SD)/%
Age (years)	12.0 (0.1)
Sex, *n* (%)	
Female	48.8%
Male	51.2%
Race/ethnicity (%)	
White	54.1%
Latino/Hispanic	19.9%
Black	16.0%
Asian	5.40%
Native American	3.20%
Other	1.41%
Household income (%)	
Less than $25,000	16.4%
$25,000 through $49,999	20.4%
$50,000 through $74,999	18.3%
$75,000 through $99,999	16.4%
$100,000 through $199,999	21.8%
$200,000 and greater	6.80
Parent education (years)	16.5 (2.63)
Cyberbullying (Year 2)	
Victimization	9.50%
Perpetration	1.10%
Youth-reported eating disorder symptoms (Year 2)	
Worry about weight gain	1.45%
Self-worth tied to weight	1.67%
Inappropriate compensatory behavior to prevent weight gain	6.51%
Binge eating	7.50%
Distress with binge eating	2.89%

Note: Propensity weights were applied to yield representative estimates based on the American Community Survey from the US Census.

matched by sex (49% female) and racially and ethnically diverse (46% non-White). The prevalence of lifetime cyberbullying victimization and perpetration was 9.5% and 1.1%, respectively. The prevalence of the different eating disorder symptoms varied between 1.5% and 7.5%.

Adjusted Poisson regression models examining the cross-sectional associations between cyberbullying victimization or perpetration and eating disorder symptoms are presented in Table 2. Cyberbullying victimization was associated with worry about weight gain (prevalence ratio [PR] 2.41, 95% confidence interval [CI] 1.48–3.91), self-worth tied to weight (PR 2.08, 95% CI 1.33–3.26), inappropriate compensatory behavior to prevent weight gain (PR 1.95, 95% CI 1.57–2.42), binge eating (PR 1.95, 95% CI 1.59–2.39), and distress with binge eating (PR 2.64, 95% CI 1.94–3.59). Cyberbullying perpetration was associated with worry about weight gain (PR 3.52, 95% CI 1.19–10.37), self-worth tied to weight (PR 5.59, 95% CI 2.56–12.20), binge eating (PR 2.36, 95% CI 1.44–3.87), and distress with binge eating (PR 2.84, 95% CI 1.47–5.49).

4 | DISCUSSION

In this demographically diverse cohort of US early adolescents, we found that cyberbullying victimization was associated with all DSM-5 eating disorder symptoms, including worry about weight gain, self-worth tied to weight, inappropriate compensatory behavior to prevent weight gain, binge eating, and distress with binge eating. Our findings are consistent with previous studies. Cyberbullying is often appearance and weight-related (Cassidy et al., 2009), increasing the risk of poor self-esteem and unhealthy weight control behaviors (Pistella et al., 2019; Puhl et al., 2013; Sampasa-Kanyinga & Willmore, 2015). Cyberbullying victimization has been associated with disordered eating and over-eating behaviors in older adolescents and young adults (King et al., 2015; Marco & Tormo-Irun, 2018; Menzel et al., 2010; Pistella et al., 2019; Wang et al., 2022), and has also been identified as a predictor of eating disorder psychopathology (Marco et al., 2018). Our study results extend upon previous studies by showing an association between

TABLE 2 Cross-sectional associations between cyberbullying victimization or perpetration and eating disorder symptoms in the Adolescent Brain Cognitive Development Study.

	Cyberbullying victimization[a]		Cyberbullying perpetration[a]	
Eating disorder symptom	Prevalence ratio (95% CI)	*p*	Prevalence ratio (95% CI)	*p*
Worry about weight gain	**2.41 (1.48–3.91)**	**<.001**	**3.52 (1.19–10.37)**	**.023**
Self-worth tied to weight	**2.08 (1.33–3.26)**	**.001**	**5.59 (2.56–12.20)**	**<.001**
Inappropriate compensatory behavior to prevent weight gain	**1.95 (1.57–2.42)**	**<.001**	1.56 (0.82–2.97)	.177
Binge eating	**1.95 (1.59–2.39)**	**<.001**	**2.36 (1.44–3.87)**	**.001**
Distress with binge eating	**2.64 (1.94–3.59)**	**<.001**	**2.84 (1.47–5.49)**	**.002**

Note: Propensity weights were applied to yield representative estimates based on the American Community Survey from the US Census. Bold indicates $p < .05$.

[a]Covariates: race/ethnicity, sex, household income, parent education, site.

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cyberbullying victimization and all eating disorder symptoms, as defined by DSM-5 criteria, in early adolescents.

Cyberbullying perpetration was associated with the same symptoms as cyberbullying victimization, excluding inappropriate compensatory behavior to prevent weight gain. The latter case may reflect inadequate power due to the small proportion of those reporting cyberbullying perpetration and inappropriate compensatory behaviors in the sample. Although the result was not statistically significant and the effect estimate was lower than the other effect estimates, it may still be significant when viewed from a public health or clinical perspective. Our preliminary findings regarding cyberbullying perpetration would benefit from further research and replication, as we are not aware of prior studies evaluating the direct association between cyberbullying perpetration and eating disorder symptoms, or the mechanisms that might underlie such associations.

Furthermore, we found that 9.5% of the adolescents in our study had experienced lifetime cyberbullying victimization, and 1.1% had experienced lifetime cyberbullying perpetration. A scoping review of 159 prevalence studies found the prevalence range of lifetime cyberbullying victimization in adolescents to be 4.9%–65.0%, which is consistent with our finding, while the prevalence range of lifetime cyberbullying perpetration was found to be 1.2%–44.1%, which is slightly greater than our finding (Brochado et al., 2017). The heterogeneity in prevalence estimates is likely due to differences in methodology (Brochado et al., 2017).

These results should be interpreted in light of this study's strengths and limitations. Strengths include analysis of a large, national, demographically diverse, contemporary sample of early adolescents. Due to the cross-sectional nature of the data analysis, we cannot establish causality. Participants who identified as more than one race/ethnicity were categorized as only one race/ethnicity during analysis (e.g., Hispanic/Latino only), which may not capture the nuances of their multiracial identities. The measures utilized in this study were based on self-report and may be subject to reporting, social desirability, and recall bias. Furthermore, although the ABCD assessment of cyberbullying is based on and similar to the validated Cyberbullying Scale, it has not yet been validated for itself. Finally, while we do not include body mass index criteria or the frequency/severity of symptoms to differentiate participants who may fit specific eating disorder phenotypes, we acknowledge that identifying the risk factors for the severity of eating disorders as well as specific eating disorders using the ABCD cohort is an important area of future research.

Future studies should continue to examine the relationship between cyberbullying and eating disorder symptoms as the ABCD cohort ages to mid and late adolescence, when the diagnosis of eating disorders increases in prevalence. Studies evaluating the prospective association between cyberbullying and eating disorder symptoms, as well as the association between cyberbullying and specific eating disorders (e.g., anorexia nervosa, bulimia nervosa, and binge eating disorder) represent other possible areas for future research. Further research is also needed to understand the mechanisms that underpin the findings from this study.

The findings of this study have significant implications for public policy, public health, and clinical practice, especially with regards to informing strategies for cyberbullying and eating disorder prevention and intervention in the early adolescent population. In particular, our study supports the use of strategies to teach early adolescents methods to navigate negative appearance-related online comments. Furthermore, adolescents who have experienced cyberbullying could benefit from eating disorder prevention programs to minimize the risk of eating disorder development. In addition, digital literacy curricula could provide anticipatory guidance about cyberbullying and disordered eating among early adolescents. Pediatricians can also consider inquiring about cyberbullying and eating disorder symptoms among early adolescents and provide anticipatory guidance as needed.

AUTHOR CONTRIBUTIONS

Chloe M. Cheng: Conceptualization; writing – original draft; writing – review and editing. **Jonathan Chu:** Conceptualization; formal analysis; writing – original draft; writing – review and editing. **Kyle T. Ganson:** Writing – review and editing. **Nora Trompeter:** Writing – review and editing. **Alexander Testa:** Writing – review and editing. **Dylan B. Jackson:** Writing – review and editing. **Jinbo He:** Writing – review and editing. **David V. Glidden:** Writing – review and editing. **Fiona C. Baker:** Data curation; methodology; writing – review and editing. **Jason M. Nagata:** Conceptualization; formal analysis; supervision; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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DATA AVAILABILITY STATEMENT

Data Availability Statement: Data used in the preparation of this article were obtained from the ABCD Study (https://abcdstudy.org), held in the NIMH Data Archive (NDA). Investigators can apply for data access through the NDA (https://nda.nih.gov/).

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