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Received: 19 November 2023 | Revised: 13 January 2024 | Accepted: 1 February 2024

DOI: 10.1002/eat.24169

ORIGINAL ARTICLE

International Journal of EATING DISORDERS WILEY

Prospective association of screen time with binge-eating disorder among adolescents in the United States: The mediating role of depression

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Funding information
National Institutes of Health, Grant/Award Numbers: K08HL159350, R01MH135492; Doris Duke Charitable Foundation, Grant/Award Number: 2022056

Action Editor: Ruth Striegel Weissman

Abstract

Objective: Screen time has been reported to be associated with binge-eating disorder (BED) among adolescents in the US; however, potential mediators remain unclear. This study aimed to evaluate depression symptoms as a mediator of the prospective association between screen time and BED.

Method: We utilized data from 9465 children (aged 9–11 years at baseline) from the Adolescent Brain Cognitive Development (ABCD) study (2016–2021). A generalized structural equation model was used to examine the prospective association between average daily screen time at baseline and BED at year 2, adjusting for baseline BED diagnosis, and other potential covariates (e.g., age, sex, and income). Mediation was examined using bias-corrected (BC) 95% confidence intervals for the indirect effect of baseline screen time on year 2 BED through depression symptoms (change from baseline to year 1).

Results: One hundred and one participants (42.7% male, 49.4% racial/ethnic minority) met the criteria for BED in year 2. Participants were 9.9 years of age on average at baseline, 51.3% identified as male, and 43.1% identified as a racial/ethnic minority. Adjusting for covariates, screen time was prospectively associated with BED

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(OR = 1.09, 95% CI [1.03, 1.14], $p = .005$). Depression symptoms ($B = .19$, BC 95% CI [0.10, 0.28]) partially mediated (9.2%) the prospective association between screen time and BED.

Discussion: Among US adolescents, higher baseline screen time was prospectively associated with BED diagnosis at year 2, and this relationship was partially mediated by increased depression symptoms. Preventive approaches targeting high screen use may have utility for reducing BED risk among adolescents.

Public significance: Among U.S. adolescents, higher screen time was prospectively associated with the incidence of BED. This association was partially mediated by the change in depressive symptoms. Preventive approaches targeting high screen use may have utility for reducing BED risk among adolescents.

KEYWORDS
binge eating, depression, feeding and eating disorders, screen use, social media

1 | INTRODUCTION

In the last decade, rapid technological advances have led to an increase in digital screen use among adolescents. According to the 2023 US Surgeon General's Advisory, 95% of adolescents aged 13–17 years reported using social media platforms, with over 33% indicating they use social media "almost constantly" (Office of the Surgeon General, 2023). It was also reported that about 40% of children aged 8–12 years use social media (Office of the Surgeon General, 2023) in the U.S. This pattern of increasing screen time has raised concerns about its potential effects on mental and physical health among adolescents (Domingues-Montanari, 2017; Lissak, 2018).

Emerging work on adolescent mental health outcomes in relation to screen time has focused on numerous forms of psychopathology, including eating disorders (Fiechtner et al., 2018; Padín et al., 2021; Santos et al., 2023). Concurrent and prospective associations between excessive screen time and binge-eating disorder (BED) in particular have been reported previously in studies of U.S. adolescents, including by our group (Nagata et al., 2021) and others (Fiechtner et al., 2018; Kim & Mackert, 2022; Saul et al., 2022; Vizcaino et al., 2020). In contrast, research on potential psychological mediators of this association has been comparatively limited. For example, one longitudinal study of adolescents found that self-esteem was a significant mediating variable between screen time and eating-related symptoms (Livet et al., 2022), but this was not specific to BED. However, other theoretically salient clinical factors have yet to be explored in relation to BED. Depression symptoms represent one factor that may underlie the association between screen time and binge eating. Specifically, evidence suggests that higher screen time is associated with depression symptoms (Boers et al., 2019), likely due to a combination of social, psychological, and behavioral factors such as reduced social interactions, sleep disturbances, and physical inactivity (Boers et al., 2019; Li et al., 2022). Moreover, depression is one of the common co-occurring mental health concerns in individuals with BED (Araujo et al., 2010), and findings from prior research indicate that depression is a risk factor for BED onset (Wade, 2017). Among adolescents specifically, those with (versus without) depression symptoms are more likely to develop BED symptoms 12 months later (Kenny et al., 2022). Depression and negative affect, more broadly, also are implicated as precipitating factors in several conceptual models of binge eating and related behaviors, such as affect regulation theories and the dual pathway model (Weinbach et al., 2018). However, to our knowledge, no prospective studies have examined depression symptoms as a mediator of the association between screen time and BED onset in adolescents.

Our prior analyses using data from the Adolescent Brain Cognitive Development (ABCD) Study, a large, diverse national (U.S.) cohort of 9–10-year-olds followed prospectively, provide the foundation for the present study (Nagata, Smith-Russack, et al., 2023). At baseline, participants reported nearly 4 h of daily screen time (Nagata et al., 2022), and the prevalence of BED was 1.1% at the 1-year follow-up (Murray et al., 2022). Baseline screen time also was prospectively associated with BED at 1-year follow-up (Nagata et al., 2021). Furthermore, our findings indicated significant positive associations between food insecurity and adverse childhood experiences (ACEs) with BED (Chu et al., 2022; Nagata, Smith-Russack, et al., 2023). These two factors are also known to be linked to negative emotional, cognitive, and behavioral outcomes, including depression symptoms (Schilling et al., 2007; Zheng et al., 2021). Therefore, we considered these factors in the current study.

The ABCD study recruited participants aged 9–10 at baseline because it is the age of the transition from childhood to adolescence. This transition period includes significant changes in cognitive abilities, emotional regulation, and social skills. This age allows us to identify risk factors for mental and physical health outcomes. The diverse cohort provides insights into the interplay of genetic, environmental, and behavioral factors during early adolescence informing targeted interventions and preventive strategies. Therefore, the objectives of this investigation were to examine the prospective association of screen time with BED onset over 2 years in a diverse sample of U.S. adolescents and to determine if depression symptoms at the 1-year follow-up mediated that association. We selected these

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intervals to assess the stability and consistency of cross-sectional findings over a longitudinal framework. This longitudinal approach allows us to not only confirm the initial cross-sectional results but also to observe the progression or variation over time, which is essential for drawing more reliable and insightful conclusions about the relationships among our study variables.

2 | METHOD

2.1 | Participants

The ABCD study, established in 2016–2018, is an ongoing longitudinal, epidemiological study of brain development and child health in the U.S. 11,875 children (aged 9–10 years) were recruited from 21 recruitment sites. Details about the ABCD Study participants, recruitment, protocol, and measures are reported elsewhere (Barch et al., 2018). The current study utilized data from baseline to year 2 of the ABCD study. We excluded those with missing data for screen time or covariates at baseline ($n = 1262$), depression symptoms at baseline and year 1 ($n = 534$), and BED diagnosis at year 2 ($n = 614$) (see Table A1 for a comparison of characteristics of included and excluded participants), with 9465 participants remaining for the current analyses.

Institutional review board approval was received from the University of California, San Diego, and the respective IRBs of each study site. Written assent and informed consent were obtained from participants and caregivers, respectively.

2.2 | Measures

2.2.1 | Screen time

Screen time was assessed using the ABCD Youth Screen Time Survey administered at baseline (2016–2018). The survey included 14 questions about the number of hours per weekday/weekend day they spent on six different screen modalities, including: viewing/streaming TV shows or movies, watching/streaming videos [e.g., YouTube], playing videogames, texting, video chatting [e.g., Skype, Facetime], and social media [e.g., Facebook, Instagram, Twitter]. Screen time for weekdays and weekends was calculated separately based on a previously validated measure (Bagot et al., 2018; Gray et al., 2020; Paulus et al., 2019). From these data, we calculated a weighted average to obtain participants' average daily screen time (Guerrero et al., 2019), using the following formula: [(weekday average × 5) + (weekend average × 2)]/7 (Guerrero et al., 2019). Weighted average screen time was reported as a continuous variable reflecting average daily screen time in hours. An examination of the concordance between self-reported screen time and screen time measured objectively using a passive-sensing smartphone app offers support for the validity of the self-report measure (i.e., a moderate correlation, $r = 0.49$; Wade et al., 2021).

2.2.2 | Binge-eating disorder

BED was assessed at baseline (2016–2018) and year 2 (2018–2021) using the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5) (Kaufman et al., 1997), which utilizes DSM-5 definitions to classify mental health concerns in children and adolescents (Sarmiento & Lau, 2020). Parents/caregivers completed a subset of KSADS-5 modules assessing the frequency, duration, and characteristics of their child's eating behaviors. Based on the KSADS-5 scoring system, responses to the relevant interview questions were used to diagnose BED consistent with DSM-5 criteria (Sarmiento & Lau, 2020). Overall, the KSADS has demonstrated good convergent validity with clinical rating scales of depressive and anxiety disorders (Townsend et al., 2020), and there is favorable concordance between parent and adolescent self-report for these mental health concerns (Townsend et al., 2020). However, validity data for BED specifically are lacking. While earlier studies with different measures have suggested low concordance between parent and child reports of binge eating (Tanofsky-Kraff et al., 2005; Townsend et al., 2020), it is important to note that parents play a crucial role as reporters for eating disorders in their children, given that youth may have limited insight into their eating behaviors.

2.2.3 | Change in depression symptoms

At baseline (2016–2018) and year 1 (2017–2019), parents/caregivers completed the Child-Behavior Checklist (CBCL) (Achenbach & Ruffle, 2000), responding to statements about their child's behavior using a scale from 0 (not true) to 2 (very true/often true). The questionnaire was based on the CBCL's DSM-Oriented Scales which consists of six scales developed to help practitioners in the differential diagnostic process, including depression symptoms (Achenbach & Ruffle, 2000). Change in depression symptom scores from baseline to year 1 were analyzed in the current study. The Child Behavior Checklist has high test–retest reliability (intraclass correlation coefficient [ICC] = .95), acceptable internal consistency (Taber, 2018) with alphas ranging from .63 to .79, and robust validity (all items showing significant discrimination at $p < .01$) (Achenbach & Rescorla, 2000). Confirmatory factor analysis results for the DSM-Oriented Scales indicate a good fit (comparative fit index [CFI] of .96 and root mean square error of approximation [RMSEA] of .045) (Hu & Bentler, 1999; Price et al., 2013).

2.2.4 | Covariates

Based on their theoretical relevance to the prospective relationship between screen time and BED (Chu et al., 2022; Nagata et al., 2021; Nagata, Chu, et al., 2023), the following baseline variables were included as covariates in the analyses: age (years), sex (female, male), race/ethnicity (White, Latino/Hispanic, Black, Asian, Native American, and other), household income (U.S. dollars, six categories: less than $25,000, $25,000 through $49,999, $50,000 through $74,999, $75,000 through $99,999, $100,000 through $199,999, and

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$200,000 and greater), highest parental education (high school or less vs. college or more), food insecurity (food secure vs. food insecure), adverse childhood experiences (ACEs, number of ACEs), study site, BED diagnosis at baseline, and the date of BED diagnoses (pre-COVID (before March 13, 2020) and during COVID).

2.2.5 | Statistical analysis

Differences in baseline characteristics according to year 2 BED diagnosis were examined using Students' *t*-tests and chi-square tests. Generalized structural equation models with maximum likelihood estimation were used to assess prospective associations of average daily screen time at baseline and depression symptoms from baseline to year 1 with BED at year 2, adjusting for age, sex, race, household income, highest parental education, study site, BED diagnosis at baseline, date of BED diagnoses, food insecurity, and ACEs. The prospective association between baseline screen time and the change in depression symptoms from baseline to year 1 was also examined. The model was not adjusted for the covariates, as doing so may increase the variance of the natural direct effect (NDE) estimator and may either elevate or diminish the variance of the natural indirect effect (NIE) estimator (Diop et al., 2021). Furthermore, the change in depression symptoms was examined as a mediator of the association between baseline screen time and year 2 BED. A *p*-value of <.05 was considered to indicate statistical significance. We generated bias-corrected (BC) 95% CIs for the indirect effect using 5000 bootstrap samples and statistical significance was indicated if the CI values did not cross zero. Finally, we calculated the effect size for the association between screen time and the change in depression symptoms with BED using standardized values. Screen time and the change in depression symptoms were normalized by subtracting the means and dividing by the standard deviations before applying generalized structural equation models. Analyses were performed using Stata 18 (College Station, TX), and propensity weights based on the American Community Survey were applied (Heeringa et al., 2017).

3 | RESULTS

3.1 | Participant characteristics

A total of 9465 children aged 9–11 years at baseline were included in this study. Among them, 101 children met the criteria for BED in year 2 (see Table 1). Compared to adolescents without BED, those with BED had higher average daily screen time at baseline and higher change in depression symptoms from baseline to year 1 ($p < .001$; see Table 1).

3.2 | Prospective associations of screen time and depression symptoms with BED

Table 2 shows findings from unadjusted and adjusted models for the associations of average daily screen time at baseline and increased depression symptoms from baseline to year 1 with BED diagnosis at year 2. Adjusting for covariates, higher baseline screen time was significantly associated with a 9% increase in the odds of BED diagnosis at year 2 (OR = 1.09, 95% CI 1.03, 1.14, $p = .005$). Similarly, increased depression symptoms from baseline to year 1 were significantly associated with a 21% increase in the odds of BED diagnosis at year 2 (OR = 1.21, 95% CI 1.11, 1.32, $p < .001$) when adjusting for covariates.

3.3 | Prospective association of screen time with depression symptoms

Higher baseline screen time was significantly associated with increased depression symptoms from baseline to year 1 ($B = .04$, 95% CI .03, .05, $p < .001$).

3.4 | Mediation analysis

Adjusting for covariates, the results showed a significant indirect effect of screen time at baseline on BED at year 2 (OR = 1.01 (1.00, 1.01); $B(SE) = .008$ (.002); bias-corrected 95% CI .004, .014; $p < .001$). This suggests that increased depression symptoms partially mediated the relationship between baseline screen time and BED in year 2. However, there was also a significant direct effect between baseline screen time and BED at year 2 (OR = 1.09 (1.03, 1.14); $p = .005$), indicating that the association was not entirely explained by increasing screen time. This finding supports partial mediation, suggesting the presence of additional pathways in which screen time may influence BED.

The contribution of depression symptoms as a mediator of the association between screen time and BED was 9.2% (95% CI 1.9%, 16.5%, $p = .013$). Pathway estimates are shown in Figure 1.

4 | DISCUSSION

Consistent with our hypotheses, we found that a higher average daily screen time at baseline was prospectively associated with the incidence of BED 2 years later in a national sample of U.S. adolescents participating in the ABCD study. We also found that baseline screen time was associated with increased depression symptoms over 1 year and that increased depression symptoms from baseline to year 1 partially mediated the association between baseline screen time and year 2 BED incidence.

The current prospective findings on the incidence of BED at the two-year follow-up extend prior work showing a positive association between screen time and BED among adolescents (Fiechtner et al., 2018; Nagata et al., 2021). Moreover, replicating findings from prior studies, this investigation found that screen time was also prospectively associated with increased depression symptoms over 1 year (Boers et al., 2019; Li et al., 2022). However, different studies have

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TABLE 1 Characteristics of participants with and without binge-eating disorder (BED) at year 2 follow-up in the Adolescent Brain Cognitive Development (ABCD) Study.

Sample size	Non-BED 9364	BED 101	Total 9465	*p*	Effect size
Age (baseline) (years), mean (*SD*)	9.9 (0.6)	9.9 (0.6)	9.9 (0.6)	.606	0.067
Sex (%)					
Female	48.6%	57.3%	48.7%	.095	0.019
Male	51.4%	42.7%	51.3%		
Parental education (baseline) (%)					
≥College	83.8%	78.8%	83.7%	.221	0.015
≤High school	16.2%	21.2%	16.3%		
Household income (baseline) (%)					
<25K	16.4%	28.4%	16.6%	.002	0.050
25 to <50K	19.5%	26.1%	19.5%		
50 to <75K	17.8%	19.0%	17.8%		
75 to <100K	14.5%	10.0%	14.5%		
100 to <200K	24.1%	14.5%	24.0%		
≥200K	7.7%	2.0%	7.6%		
Race/ethnicity (baseline) (%)					
White	56.9%	50.6%	56.9%	.291	0.036
Latino	17.7%	20.9%	17.7%		
Black	15.3%	21.2%	15.3%		
Asian	5.4%	-	5.4%		
Native American	3.0%	5.1%	3.0%		
Other	1.7%	2.2%	1.7%		
BED diagnosis (baseline) (%)					
Non-BED	99.6%	83.8%	99.4%	<.001	0.222
BED	0.4%	16.2%	0.6%		
Food insecurity (baseline) (%)					
Food secure	91.1%	83.2%	91.0%	.063	0.030
Food insecure	8.9%	16.8%	9.0%		
Date of BED diagnoses					
Pre-COVID	71.3%	58.5%	71.1	.048	0.031
During COVID	27.7%	41.5%	28.9		
ACEs (number of ACEs) (baseline), mean (*SD*)	1.9 (1.7)	2.7 (1.5)	1.9 (1.7)	<.001	0.586
Average daily screen time (baseline) (h), mean (*SD*)	3.9 (3.1)	5.4 (3.3)	3.9 (3.1)	<.001	0.482
Change in depression symptoms (baseline to year 1), mean (*SD*)	1.1 (1.5)	2.2 (2.0)	1.1 (1.5)	<.001	0.732

Note: Each continuous variable is reported as mean (standard deviation). Results based on Student's *t*-tests and Chi-square tests for continuous and categorical variables, respectively. Effect sizes were calculated as Cohen's *d* for continuous variables and Cramer's *V* for categorical variables.

yielded different results regarding the relationship between screen time and depression symptoms. While some have suggested a bidirectional relationship (Houghton et al., 2018), others have not found such a relationship (Fitzpatrick et al., 2023) or have reported that depression symptoms do not predict digital media use 4 years later (Engberg et al., 2022). The directionality of the association is crucial, with a stronger influence of screen time on depression symptoms than the reverse; notably, the use of newer forms of technology (such as smartphone use) exhibits a more robust association compared to older forms (such as watching television) (Tang et al., 2021). The current results contribute to the broader literature regarding negative mental and physical health outcomes associated with screen time in adolescents (Boers et al., 2019; Twenge et al., 2019).

Perhaps most notably, we found that increased depression symptoms partially mediated the prospective association between screen time and BED. This finding is consistent with a prior study that found

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TABLE 2 Associations of baseline average daily screen time and change in depression symptom scores (baseline to year 1) with year 2 binge-eating disorder (BED) in the Adolescent Brain Cognitive Development (ABCD) study.

	Unadjusted			Adjusted[a]			
Variables	*B* (95% CI)	OR (95% CI)	*p*	*B* (95% CI)	OR (95% CI)	Effect size[b] (standardized coefficient)	*p*
Average daily screen time (baseline)	0.10 (0.05, 0.15)	1.31 (1.20, 1.42)	<.001	0.08 (0.031, 0.14)	1.09 (1.03, 1.14)	0.213	.005
Change in depression symptoms (baseline to year 1)	0.27 (0.18, 0.35)	1.30 (1.20, 1.42)	<.001	0.19 (0.10, 0.28)	1.21 (1.11, 1.32)	0.453	<.001

[a]Adjusted for baseline age, sex, race, household income, parent education, BED diagnosis, food insecurity, ACEs, and date of BED diagnosis.
[b]The standardized coefficient was computed by subtracting the mean from each variable and then dividing the result by the standard deviations (*SD*) before applying generalized structured equation models.

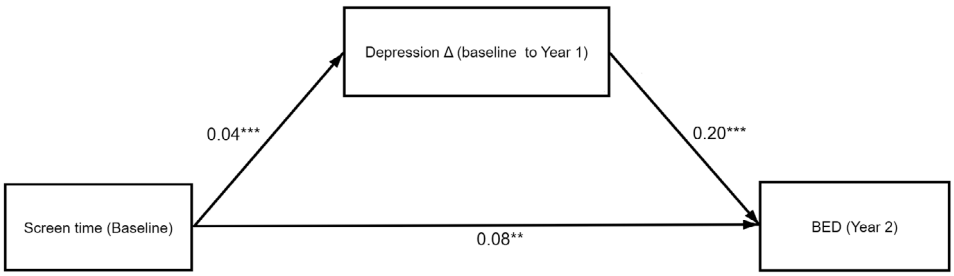


FIGURE 1 The indirect effect of baseline average daily screen time on year 2 binge-eating disorder (BED) through the change in depression symptoms from baseline to year 1. We provide estimated coefficients for the adjusted structural equation models. *$p < .05$; **$p < .01$; ***$p < .001$.

that depression was a significant mediating factor in the relationship between social media use and overall disordered eating symptoms (as reflected by the Eating Attitudes Test-26 total score) in adolescents (Ghergut et al., 2022). Higher screen time may contribute to increased depression symptoms through several interpersonal (e.g., less social interactions, lower social support) and behavioral (e.g., poor sleep quality, less physical activity) factors (Boers et al., 2019; Li et al., 2022). Furthermore, screen time on social media may contribute to lowering self-esteem and increased depression symptoms in adolescents via upward social comparisons (i.e., comparing themselves to others who have more favorable social positions) (Li et al., 2022). Although not examined here, the role of social media screen time may be particularly relevant to eating disorders like BED, given potential impacts on other known risk factors such as body dissatisfaction and dietary restraint.

The prospective link between the increased depression symptoms and BED found in this study is consistent with several theories of binge-eating risk/maintenance. For example, both affect regulation theory and escape theory (Heatherton & Baumeister, 1991) conceptualize binge eating as functioning to reduce the experience/awareness of aversive affective states (Gross, 2015; Spoor et al., 2006). Further, individuals with lower self-esteem and negative body image are at an increased risk of engaging in binge eating. Cognitive and emotional reactions following exposure to media or advertising featuring unrealistic body ideals could exacerbate the risk for binge-eating and eating disorders more broadly (Kenny et al., 2022). Moreover, findings from ecological momentary assessment studies evaluating real-time affect in relation to subsequent binge eating have also shown that increases in negative affect commonly precipitate binge-eating episodes (Haedt-Matt & Keel, 2011), and that negative affect mediates the relationship between stressful events and binge eating (Goldschmidt et al., 2014). However, increased depression symptoms were only found to be a partial mediator of the relationship between screen time and BED in the current investigation, indicating that screen time may have a direct effect on BED onset among adolescents, and/or other factors may mediate this association. A possible explanation for the direct effect of screen time on BED is that adolescents are more susceptible to various forms of disinhibited eating when distracted by screens, even in the absence of hunger (Fiechtner et al., 2018; Kim et al., 2020). Additionally, the habit of binge-watching content may contribute to overconsumption and a lack of control, similar to patterns observed in binge-eating behaviors (Flayelle et al., 2019; Vizcaino et al., 2020). There is a need for additional research to identify other potential mediators that contribute to this association.

The current study added to the existing literature by elucidating potential mechanisms involved in the onset of BED and highlighting modifiable risk factors like screen time. These findings may offer clinical and public health implications as adolescents could benefit from interventions aimed at reducing excessive screen time and thus mitigating associated mental health issues, such as depression symptoms. It also revealed a partial mediating effect; targeting screen use can improve other related symptoms (e.g., depressive symptoms) too.

4.1 | Strengths and limitations

This study had several strengths. First, the prospective data allowed us to test the temporal associations of the variables in the proposed mediation model. Second, by controlling for baseline BED diagnosis,

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the focus of the analyses was on the incidence of BED, strengthening the ability to derive clinically meaningful implications. Third, data was collected from a large, diverse, population-based sample of U.S. adolescents, supporting the generalizability of the findings to U.S. adolescent populations. However, there were also limitations. First, screen time was self-reported by adolescents, and thus subject to potential self-report bias. Second, depression symptom and BED diagnosis variables were based on parent reports, and findings may be different from those based on adolescent-reported measures. Parents are important reporters of eating disorders in younger children given that youth may have less insight and more limited recollection regarding their eating behaviors (Barch et al., 2018; Braet et al., 2007). However, this may lead to lower concordance between parent and child reports of binge eating (Bartholdy et al., 2017; Tanofsky-Kraff et al., 2005). Third, the available data lacked details regarding the content of screen time, including content that may be particularly salient to BED risk (e.g., body image-related); therefore, future research examining specific content-based screen time in relation to BED risk is recommended. Fourth, the number of participants who met the criteria for BED in this study was relatively small ($n = 101$). Among them, only 49.4% were non-white, which resulted in inadequate sample sizes to compare across racial/ethnic groups. Future studies with a more diverse sample of youth with BED are needed, as other important factors (e.g., discrimination, acculturative stress) among racial/ethnic groups may be salient to BED risk and the associations examined here (Raney et al., 2023). Further, the content of screen time (e.g., social media, TV, etc.) may differentially relate to binge eating across groups.

5 | CONCLUSION

In this national longitudinal study of U.S. adolescents, we found that higher screen time was prospectively associated with increased depression symptoms and increased incidence of BED and that the association between screen time and BED incidence was partially mediated by increased depression symptoms. These findings suggest that approaches to reducing excessive screen time among adolescents may have benefits in terms of reducing depression and BED risk. Such interventions may focus on educating parents and adolescents about the negative mental and physical health impacts of excessive screen time. Healthcare providers may consider screening for screen time, depression symptoms, and binge eating among adolescents. Finally, given that increased depression symptoms not only partially mediated the association between screen time and BED, but also emerged as a strong predictor of BED, future research should explore other theoretically relevant psychosocial and behavioral variables that may also underlie the association between screen time and BED in adolescents.

AUTHOR CONTRIBUTIONS

Abubakr A. A. Al-shoaibi: Conceptualization; formal analysis; writing – original draft; writing – review and editing. **Iris Yuefan Shao:** Writing – review and editing. **Kyle T. Ganson:** Writing – review and editing. **Jason Matthew Lavender:** Writing – review and editing. **Alexander Testa:** Writing – review and editing. **Orsolya Kiss:** Writing – review and editing. **Jinbo He:** Writing – review and editing. **David Glidden:** Writing – review and editing. **Fiona C. Baker:** Conceptualization; data curation; methodology; writing – review and editing. **Jason Ming-Hung Nagata:** Conceptualization; formal analysis; supervision; writing – original draft; writing – review and editing.

ACKNOWLEDGMENTS

The authors thank Sean Kim, Seohyeong Lee, Zain Memon, Smriti Panchal, and Anthony Kung for editorial assistance.

FUNDING INFORMATION

J.M.N. was funded by the National Institutes of Health (K08HL159350 and R01MH135492) and the Doris Duke Charitable Foundation (2022056). O.K., D.G., and F.B. were funded by the National Institutes of Health (R01MH135492).

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts to disclose.

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/).

ETHICS APPROVAL

The University of California, San Diego (UCSD) provided centralized institutional review board (IRB) approval and each participating site received local IRB approval.

CONSENT TO PARTICIPATE

Written informed consent was obtained from the parents/caregivers of adolescents, and written assent was obtained from adolescents.

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How to cite this article: Al-Shoaibi, A. A. A., Shao, I. Y., Ganson, K. T., Lavender, J. M., Testa, A., Kiss, O., He, J., Glidden, D. V., Baker, F. C., & Nagata, J. M. (2024). Prospective association of screen time with binge-eating disorder among adolescents in the United States: The mediating role of depression. *International Journal of Eating Disorders*, *57*(5), 1192–1201. https://doi.org/10.1002/eat.24169

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APPENDIX A

TABLE A1 Comparison of characteristics between included and excluded participants.

Sociodemographic characteristics	Included ($n = 9465$)	Excluded ($n = 2410$)	p
Age	9.9 (.63)	9.9 (.60)	.933
Sex (%)			
Female	48.6%	49.2%	.733
Male	51.4%	50.8%	
Race/ethnicity (%)			
White	56.9%	35.0%	<.001
Latino/Hispanic	17.7%	28.0%	
Black	15.3%	24.2%	
Asian	5.4%	5.8%	
Native American	3.0%	3.7%	
Other	1.7%	3.3%	
Household income (%)			
$24,999 or less	16.6%	33.7%	<.001
$25,000 to $49,999	19.6%	23.6%	
$50,000 to $74,999	17.8%	15.4%	
$75,000 to $99,999	14.5%	7.9%	
$100,000 to $199,999	23.9%	14.1%	
$200,000 and greater	7.6%	5.3%	
Parent's highest education			
College education or more	83.7%	35.1%	<.001
High school education or less	16.3%	64.9%	
BED diagnosis (baseline) (%)			
Non-BED	99.4%	99.2%	<.549
BED	.6%	.8%	
Food insecurity (baseline) (%)			
Food secure	91.0%	88.0%	.005
Food insecure	9.0%	12.0%	
Average daily screen time (baseline) (h), mean (*SD*)	3.9 (3.1)	4.4 (3.2)	<.001
ACEs (number of ACEs) (baseline), mean (*SD*)	1.9 (1.7)	1.8 (1.6)	.101
Change in depression symptoms (baseline to year 1), mean (*SD*)	1.7 (1.9)	1.6 (1.8)	.260

Note: ABCD propensity weights were applied based on the American Community Survey from the US Census.

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