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Screen Time and Obsessive-Compulsive Disorder Among Children 9–10 Years Old: A Prospective Cohort Study

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Abstract

Purpose: To determine the prospective associations between baseline screen time and obsessive-compulsive disorder (OCD) at two-year follow up in a national (U.S.) cohort of 9–10 -year -old-children.

Method: We analyzed prospective cohort data from the Adolescent Brain Cognitive Development (ABCD) Study (n = 9,208). Logistic regression analyses were used to determine the associations between baseline self-reported screen time (exposure) and OCD, based on the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5, outcome), at two-year-follow-up, adjusting for race/ethnicity, sex, household income, parent education, family history of psychopathology, and study site, excluding participants with baseline OCD.

Results: The sample was 48.9% female and racially and ethnically diverse (43.5% non-White). Each additional hour of total screen time was prospectively associated with 1.05 higher odds of OCD at 2-year-follow-up (95% confidence interval [CI] 1.01–1.09). For specific screen time modalities, each additional hour of playing video games (adjusted odds ratio [aOR] 1.15, 95% CI

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1.03–1.28) and watching videos (aOR 1.11, 95% CI 1.01–1.23) was associated with a subsequent OCD diagnosis.

Conclusion: Video games and watching videos are prospectively associated with new-onset OCD in early adolescents. Future research should examine mechanisms linking these specific screen modalities to OCD development to inform future prevention and intervention efforts.

Keywords

Screen time; video game; video; obsessive-compulsive disorder; adolescent

Introduction

Digital technology has become more integrated in the lives of adolescents than ever before. Exacerbated by the COVID-19 pandemic, both screen use and mental health problems in adolescents have increased in recent years [1,2], and most evidence indicates an association between high levels of screen time and unfavorable psychological outcomes [3–6]. One mental health condition of concern as screen use ubiquitously rises is obsessive compulsive disorder (OCD) [7]. OCD is characterized by recurrent and unwanted intrusive thoughts and repetitive behaviors that an individual feels driven to perform [8]. OCD can have severely debilitating and long-lasting effects on adolescent development that extend into adulthood such as social isolation, having fewer relationships than their peers, comorbid mental illnesses, and diminished quality of life [9,10]. With contemporary technology platforms potentially facilitating compulsive checking of content and repetitive behaviors [11], the question of whether high levels of screen time are associated with mental health conditions like OCD is of the utmost importance.

Several etiological theories for OCD have been proposed [12,13], and cognitive-behavioral models may provide the theoretical basis for an association between high levels of screen time and increased OCD risk in adolescents. Screen use may be related to OCD through cognitive-behavioral models linking OCD with perfectionism, overestimation of threat, or perceptual biases or deficits [12,13]. Screen use could promote perfectionism through needing to attain a perfect score on a video game or overestimation of threat by being exposed to screen violence. Perfectionism and overestimation of threat are belief domains that may play an important role in the development of obsessions from intrusive thoughts [12]. In addition, screen time could lead to biases in self-perception through comparisons with others such as influencers on social media or YouTube videos, which could lead to intrusive thoughts and develop into obsessions [13]. For instance, recent literature has proposed that when followers develop intense relationships with social media influencers, they can become increasingly obsessed, leading to problematic engagement and unstable emotional responses (i.e., envy, anxiety, fear of missing out) that may ultimately contribute to OCD [14,15].

Previous literature highlighted a variety of negative mental health outcomes such as anxiety and depression being associated with greater screen time in adolescents [3]. However, limited research has analyzed the associations between screen time and OCD in adolescents. One study of young adults found that addictive use of video games and social media was

associated with OCD [16]. However, other studies have shown mixed results and often did not target OCD as their primary focus [7,17,18]. Previous literature has also focused on young adults with minimal study of adolescents [19]. As there is a peak of incidence of OCD at 9–10 years of age, there is a need to study screen time exposure during this critical time period in the development of OCD [20]. Furthermore, most previous studies have been cross-sectional, thus offering less utility in determining possible causes of adolescent OCD development than a prospective cohort study design, in which the exposure temporally precedes the outcome. Given these gaps in the current literature and the fact that around half a million adolescents in the U.S. suffer from OCD [21], it is critical that the associations between screen use and OCD in adolescents become better elucidated using prospective data from cohort studies. Analyzing these associations could offer new insights in the context of adolescent and public health.

The current study aims to bridge current gaps in the literature by examining the prospective relationship between different contemporary forms of screen time and subsequent diagnosis of OCD in a diverse, nationwide sample of 9–10-year-old adolescents participating in the Adolescent Brain Cognitive Development (ABCD) study. This study allows for the examination of the association between different forms of screen use such as television, video games, texting, watching videos, video chat, and social networking with the development of new onset OCD. Furthermore, it examines this relationship in early adolescents, an age group that has previously been neglected in the current literature on screen time and OCD. The current prospective study hypothesizes that greater screen time will be associated with subsequent diagnosis of OCD.

Methods:

Study Population

The current study analyzed prospective data from the Adolescent Brain Cognitive Development (ABCD) Study (https://abcdstudy.org). The ABCD study is a longitudinal study of brain development and health across adolescence in 11,875 children recruited from 21 sites around the U.S. (Appendix A). With the aim of creating a sample representative of the diversity within the U.S., the ABCD study implemented epidemiologically informed strategies via school systems and attention to sociodemographic factors. Additional details are outlined elsewhere [22]. The present study analyzed data from the ABCD 4.0 release (held in the National Institute of Mental Health Data Archive) for the baseline (2016–2018, 9–10 years old) and two-year follow-up (2018–2020, 11–12 years old) assessments. Exclusion criteria included participants who had missing data for screen time, OCD, or confounder data used in the analysis (n=2,667), leaving 9,208 included in the analysis (see Appendix B). We further excluded 666 participants with OCD at baseline for one of the regression models (Model 3). Centralized institutional review board (IRB) approval was obtained from the University of California, San Diego. Study site approvals were obtained from their respective IRBs. Caregivers of participants provided written informed consent and each child participant provided written assent.

Exposures: Screen Time

Screen time was determined using the ABCD Youth Screen Time Survey. Each participant answered questions about the typical number of hours per day they spent on several different screen modalities (viewing TV shows or movies, watching videos [e.g. YouTube], playing videogames, texting, video chatting [e.g. Skype, Facetime], and social media [e.g. Facebook, Instagram, Twitter]) for both weekdays and weekends, based on a previously validated measure [23,24]. The current study performed a weighted average calculation of the participants' typical weekday and weekend screen time use ((weekday average $\times$ 5) + (weekend average $\times$ 2))/7) to formulate a typical day measure for each screen modality [25]. The current study reported the weighted average of usage as a continuous variable. Total screen time was calculated as the sum of the six screen modalities.

Outcome: Obsessive-Compulsive Disorder

The ABCD Study utilized the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5), a widely used diagnostic tool for assessing symptoms of child and adolescent mental health disorders in the DSM-5, for the assessment of OCD [26,27]. Caregivers completed all modules of the KSADS-5 to reflect mental health symptoms and diagnoses of each participant. The present study used the KSADS-5 computerized scoring system to extrapolate interview question responses into an OCD diagnosis from reported symptoms of obsessions or compulsions corresponding to the DSM-5 at both baseline and two-year follow-up [8]. OCD scoring mirrored DSM-5 criteria including the presence of either obsessions or compulsions. The DSM-5 criteria characterize obsessions as recurrent thoughts that an individual attempts to suppress, and compulsions as repetitive behaviors that the individual feels compelled to perform secondary to the obsession [8]. For obsessions to be calculated as present in the current study, at least one 'yes' indicated from an obsessions list, 'yes' to having intrusive/unwanted thoughts, and 'yes' to attempts to neutralize or ignore the thoughts were all necessary. For compulsions to be calculated as present, at least one 'yes' was indicated from a compulsions list and at least one 'yes' to purpose of compulsions being positive. For the OCD outcome to be positive, either obsessions or compulsions needed to be calculated as present, along with any of the following being positive: time consuming obsessions, time consuming compulsions, impairment due to obsessions or compulsions, or distress related to obsessions or compulsions.

Confounders

Potential sociodemographic confounders for the association between screen time and OCD were chosen based on previous literature [28]. Age (years), sex (female, male), race/ ethnicity (White, Latino/Hispanic, Black, Asian, Native American, 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, $200,000 and greater), and highest education of participants' parents (high school or less vs. college or more) were based on parents' self-report. Baseline major depressive disorder and OCD were determined from the KSADS-5 and were included as covariates. We also excluded participants with baseline OCD in one regression model (Model 3). Family history of psychopathology was

assessed with a modified version of the Family History Assessment from a previously validated study [29,30], and included as a covariate. We adjusted for study site given potential site and regional differences (see Appendix A for a full list of the 21 study sites across the U.S.).

Statistical Analysis

Analyses were conducted in 2022 using Stata 15.1 (StataCorp, College Station, TX). We calculated descriptive characteristics for the total sample and compared baseline sociodemographic and screen characteristics of participants with and without OCD at baseline. Independent samples t-tests were conducted for continuous variables and adjusted F tests, a variant of the second-order Rao-Scott adjusted chi-square test, were conducted for categorical or binary variables. We additionally compared baseline screen characteristics for participants with and without OCD at two-year follow-up using independent samples t-tests. Multiple logistic regression analyses were conducted to estimate associations between baseline screen time (exposure variable) and OCD at two-year follow-up (outcome variable). We analyzed associations in three sets of logistic regression models: unadjusted models (Model 1); models adjusting for age, sex, race/ethnicity, household income, parent education, baseline depression, family history of psychopathology, study site, and baseline OCD (Model 2); and models adjusting for age, sex, race/ethnicity, household income, parent education, baseline depression, family history of psychopathology, and study site, excluding participants with baseline OCD (Model 3). Propensity weights were applied to yield representative estimates based on the American Community Survey from the US Census [31].

Results

Table 1 describes sociodemographic characteristics of the 9,208 participants included and compares those with (n = 666) and without (n = 8,542) an OCD diagnosis. The sample was 48.8% female and was racially and ethnically diverse (47.8% non-White). At baseline, youth on average reported 3.9 hours of screen time per day, including watching television shows/ movies (1.3 hours), playing video games (1.0 hour), watching videos (1.0 hour), texting (0.2 hours), video chatting (0.2 hours), and using social media (0.1 hours). At year two, 6.1% of the sample met diagnostic criteria for OCD, with 4.4% developing new-onset OCD from baseline to two-year-follow-up.

Table 2 shows baseline screen time differences between participants with and without OCD at two-year follow-up. Participants with OCD at follow-up reported 4.4 hours per day of total screen time, while participants without OCD at follow-up reported 3.9 hours per day of total screen time (p=0.002).

Table 3 shows logistic regression analyses examining the associations between baseline screen time and OCD at two-year-follow-up. In unadjusted models (Model 1), total screen time, watching television shows/movies, watching videos, and playing video games were associated with OCD at two-year follow-up. In models adjusting for potential confounders including baseline OCD (Model 2), total screen time, watching videos, and playing video games were associated with OCD at two-year follow-up. In adjusted models excluding

participants with baseline OCD (Model 3, n=8,542), findings were mostly similar to those reported in Model 2. Each additional hour of total screen time was prospectively associated with higher odds of OCD at 2-year-follow-up (aOR 1.05, 95% CI 1.01–1.09). For specific screen time modalities, each additional hour of playing video games (aOR 1.15, 95% CI 1.03–1.28) and watching videos (aOR 1.11, 95% CI 1.01–1.23) was associated with subsequent OCD.

Discussion

In a demographically diverse nationwide sample of 9,208 9–10-year-old children in the U.S., the current study found that longer total screen time was prospectively associated with OCD at 2-year follow-up, even after adjusting for confounders. These results held after adjusting for baseline OCD, as well as removing those with baseline OCD from the sample. The specific screen modalities most strongly associated with OCD were playing video games and watching videos. Each additional hour spent on video games was associated with 13% higher risk of subsequent OCD while each additional hour spent watching videos was associated with 11% higher risk of subsequent OCD.

The present study is novel and adds to the scant literature by examining the relationship between different contemporary forms of screen time and OCD in a large, national prospective cohort of 9–10-year-olds followed for two years. Although we did not examine underlying mechanisms of how higher levels of watching videos and video gaming could lead to increased risk for new-onset OCD, there exists a theoretical basis explaining the association between these screen time modalities and OCD. Gaming disorder, attributed to excessive engagement with video games, is associated with compulsivity and loss of behavioral control, which are core symptoms of OCD [31,32]. Cognitive-behavioral theories may explain links between video gaming and OCD. Specifically, playing video games may lead to perception biases or deficits that advance sentiments such as superfluous needs for self-reevaluation or feelings of worry, both of which may be related to OCD symptoms [13]. At the root of obsession is the culmination of persistent intrusive thoughts or images; the belief domains of perfectionism and overestimation of threat may facilitate the transition from the culmination of such intrusions to obsession [12]. Intrusions associated with video gaming may involve ideas of aggression that increase stress in the screen time user. This may perpetuate feelings of discomfort and anxiety that may be reduced by further engaging with screen time as a coping mechanism. In addition to developing or amplifying overestimation of threat—as in through exposure to violence during gaming—video game use could promote perfectionism where users may prioritize the need to attain a perfect score or exceed a previous best score. The resulting behaviors, alongside rituals within video game culture, could become compulsions. Time spent playing video games is significantly correlated with problematic video game use including spending a lot of time thinking about playing video games, feeling the need to play video games more and more, and being unable to play video games less despite trying [34].

Watching videos (such as on YouTube) could allow for compulsive viewing of homogenous content [35], which may be facilitated through algorithms or advertisements suggesting related content. Repeatedly watching the same or similar content could lead to

overestimation of threats that could contribute to obsessions stemming from intrusions instigating fear. It is interesting that we did not find an association between television watching and OCD. Possible explanations are that traditional television viewing generally has fewer programming options than YouTube, which may limit users' engagement. Thus, behaviors surrounding traditional television may not have the same potential for the clustering of specific content that may otherwise exacerbate intrusive thoughts or images.

Texting, video chat, and social media were less common screen behaviors among our 9–10-year-old sample but are expected to increase through adolescence and should be studied in older adolescent age groups. Non-significant results were likely due to the less prevalent use of these forms of screen behaviors in early adolescence. These findings may also suggest that specific forms of screen use may be more relevant to OCD development than total screen time. Future research is warranted in ascertaining whether affective symptoms co-occur with such screen time use, and whether potential patterns of compulsive screen time engagement may belong to an OCD prodrome.

Given early adolescence is a critical time period in the onset of OCD, the present study offers several implications within the realms of public and clinical healthcare. Findings are also relevant amidst the recent dramatic rise in adolescent screen time throughout the COVID-19 pandemic. The current study's cohort reported a mean of eight hours of recreational screen time per day at the beginning of the pandemic, which is 4 times the previous screen time limits set by the American Academy of Pediatrics (AAP). Concurrently, several studies have shown that OCD symptoms worsened during the COVID-19 pandemic [36], especially for individuals with contamination-related OCD [37]. While a definitive causal relationship between screen time and OCD has not yet been established, our findings inform several possibilities for intervention. These include OCD educational programs for grade-school educators, which have been shown to increase educator OCD knowledge, decrease stigma, and improve early identification and intervention in students with OCD [38] Implementation of digital literacy classes in grade-schools have demonstrated success in promoting a variety of health-related behavior changes, with limiting screen use being amongst the most common behavior changes undertaken [39]. Healthcare professionals could consider limiting excessive video games and videos in children with OCD. Video game developers and companies could develop more safeguards and game structures that encourage breaks from the game.

The current study has several limitations. The screen time measures do not capture the content, context, or quality of screen use [40], which may be important factors to consider in the development of OCD. The screen time measures were self-reported, which makes them prone to social-desirability bias. Furthermore, it may be difficult for early adolescents to estimate screen time correctly. Screen time was also not specified to be recreational, though most of the screen types analyzed in the study would be used recreationally. Although the social media measure provided examples such as Facebook, Instagram, and Twitter, there may have been other examples that could be more relevant for the targeted group. The association between total screen time and OCD was relatively weak and was mainly explained through video games and watching videos. Thus, further research is necessary to analyze the relationships between watching videos, video gaming, and OCD, and how they

covary over time, as well as potential underlying mechanisms such as the content, context, and quality of videos and video games. The current study adjusted for a variety of potential confounders including race, gender, income, parent education, baseline OCD, and family history of psychiatric disorders, however, residual confounders like the type of media that was consumed during screen time, as well as parenting and cultural differences were not examined. Future research could examine trajectories of OCD symptoms and the association between screen time and changes in OCD symptoms over time using latent growth curve analyses. Selection bias is a possibility given that participants excluded due to missing data were more likely to be racial/ethnic minorities, have lower household income, and have lower parent education. However, given that these excluded populations generally report higher screen time [2], findings may be biased towards the null. Notable strengths of the study are the large, diverse, and nationwide sample that focused on early adolescence as well as the prospective study design.

Conclusion

The current study indicates that higher screen time use is associated with new onset OCD in early adolescents. The findings should increase awareness around screen use and its possible role in OCD development. Videos and video games had the strongest associations between screen time and OCD and offer focus points for future research and interventions to prevent OCD development in early adolescence.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments:

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Implications and Contribution

In a demographically diverse nationwide sample of 9,208 9–10-year-old children in the U.S., the current study found that greater screen time, particularly from playing video games and watching videos, was prospectively associated with new onset OCD at 2-year follow-up.

Table 1.

Sociodemographic, screen time, and obsessive-compulsive disorder diagnoses of 9,208 Adolescent Brain Cognitive Development (ABCD) Study participants

	Total N=9,208	OCD (baseline) n=666	No OCD (baseline) n=8,542	
Sociodemographic characteristics (baseline)	**Mean (SD) / %**	**Mean (SD) / %**	**Mean (SD) / %**	**p**[a]
Age (years)	9.94 (0.62)	9.94 (0.60)	9.93 (0.63)	0.979
Sex, n (%)				<0.001
Female	48.9%	40.0%	49.7%	
Male	51.1%	60.0%	50.3%	
Race/ethnicity (%)				0.002
White	56.5%	52.4%	56.9%	
Latino / Hispanic	18.6%	19.2%	18.5%	
Black	15.3%	20.4%	14.9%	
Asian	5.2%	3.2%	5.3%	
Native American	3.1%	4.3%	3.0%	
Other	1.3%	0.6%	1.4%	
Household income (%)				<0.001
Less than $25,000	16.7%	29.9%	15.6%	
$25,000 through $49,999	20.1%	21.6%	20.0%	
$50,000 through $74,999	17.9%	17.7%	17.9%	
$75,000 through $99,999	14.1%	10.7%	14.4%	
$100,000 through $199,999	23.6%	16.1%	24.2%	
$200,000 and greater	7.6%	3.9%	7.9%	
Parent with college education or more (%)	83.7%	75.1%	84.4%	<0.001
Major depressive disorder (%)	0.2%	0.1%	0.2%	0.695
Family history of psychopathology (%)	60.1%	73.4%	58.9%	<0.001
Screen time variables (baseline)				
Total screen time	3.88 (3.06)	4.49 (3.10)	3.83 (3.06)	<0.001
Television shows/movies	1.29 (1.06)	1.46 (1.10)	1.28 (1.05)	<0.001
Videos (YouTube)	1.02 (1.16)	1.23 (1.27)	1.01 (1.15)	<0.001
Video games	1.03 (1.11)	1.26 (1.20)	1.01 (1.10)	<0.001
Texting	0.23 (0.54)	0.23 (0.55)	0.21 (0.43)	0.144
Video chat	0.19 (0.48)	0.19 (0.48)	0.19 (0.48)	0.866
Social networking	0.11 (0.40)	0.14 (0.45)	0.11 (0.40)	0.184

Propensity weights were applied to yield estimates based on the American Community Survey from the US Census. SD = standard deviation.

[a] p-value from independent samples t-test (continuous variables) or adjusted F, a variant of the second-order Rao-Scott adjusted chi-square test (binary or categorical variables).

Table 2.

Comparisons of baseline screen time among participants with and without obsessive-compulsive disorder (OCD) at two-year follow-up in the Adolescent Brain Cognitive Development Study (N=9,208)

	OCD (Year 2)	No OCD (Year 2)	
	Mean (SD)	Mean (SD)	p[a]
Total screen time	**4.36 (3.39)**	**3.85 (3.04)**	**0.002**
Television shows/movies	**1.43 (1.14)**	**1.28 (1.05)**	**0.011**
Videos (YouTube)	**1.18 (1.31)**	**1.01 (1.15)**	**0.008**
Video games	**1.17 (1.22)**	**1.02 (1.10)**	**0.009**
Texting	0.26 (0.59)	0.25 (0.59)	0.320
Video chat	0.19 (0.50)	0.19 (0.48)	0.937
Social networking	0.13 (0.40)	0.11 (0.40)	0.430

Bold indicates p<0.05. Propensity weights were applied to yield estimates based on the American Community Survey from the US Census. SD = standard deviation.

[a]p-value from independent samples t-test (continuous variables).

Table 3.

Associations between baseline screen time and obsessive-compulsive disorder (OCD) at two-year follow-up in the Adolescent Brain Cognitive Development Study

	Model 1: OCD at Year 2, unadjusted (n=9,208)		Model 2: OCD at Year 2, adjusting for covariates and OCD at baseline[a] (n=9,208)		Model 3: OCD at Year 2, adjusting for covariates and excluding participants with OCD at baseline[b] (n=8,542)	
	OR (95% CI)	p	AOR (95% CI)	p	AOR (95% CI)	p
Total screen time	**1.05 (1.02, 1.08)**	**0.001**	**1.04 (1.01, 1.08)**	**0.018**	**1.05 (1.01, 1.09)**	**0.012**
Television shows/movies	**1.13 (1.03, 1.23)**	**0.007**	1.08 (0.97, 1.19)	0.146	1.10 (0.98, 1.24)	0.106
Videos (YouTube)	**1.12 (1.04, 1.22)**	**0.005**	**1.10 (1.01, 1.19)**	**0.033**	**1.11 (1.01, 1.23)**	**0.038**
Video games	**1.12 (1.03, 1.22)**	**0.005**	**1.11 (1.01, 1.22)**	**0.025**	**1.15 (1.03, 1.28)**	**0.015**
Texting	1.10 (0.93, 1.29)	0.275	1.13 (0.94, 1.36)	0.194	1.20 (1.00, 1.44)	0.056
Video chat	1.00 (0.82, 1.24)	0.937	0.99 (0.80, 1.22)	0.917	0.91 (0.70, 1.18)	0.483
Social networking	1.09 (0.90, 1.31)	0.391	1.01 (0.81, 1.27)	0.927	1.07 (0.83, 1.39)	0.604

Bold indicates p<0.05. OR = odds ratio. AOR = adjusted odds ratio. Propensity weights were applied to yield estimates based on the American Community Survey from the US Census.

[a] Model 2 is adjusted for race/ethnicity, sex, household income, parent education, site, baseline major depressive disorder, family history of psychiatric disorders, and study site, and baseline OCD.

[b] Model 3 is adjusted for race/ethnicity, sex, household income, parent education, site, baseline major depressive disorder, family history of psychiatric disorders, study site, and excluding participants with OCD at baseline.