

# Letters

## RESEARCH LETTER

### Smartphone Use During School Hours by US Youth in the Adolescent Brain Cognitive Development Study

Adolescents aged 13 to 18 years spend more than 8.5 hours daily on screen-based entertainment,<sup>1</sup> and adolescent smartphone use has been associated with poor physical health, mental health, and academic outcomes.<sup>2</sup> Although 99.7% of US public school principals report their school has a smartphone policy,<sup>3</sup> few studies have objectively examined smartphone app usage during school.<sup>4</sup> This study addresses this by measuring smartphone usage in schools with passive sensing technology in a diverse sample of adolescents.

**Methods** | Data were collected from the Adolescent Brain Cognitive Development (ABCD) Study. Total smartphone time was assessed in a portion of the sample using a phone app (Effortless Assessment Research System [EARS]) from the ABCD 6.0 release.<sup>5</sup> The ABCD-EARS usage data described applications used during short collection windows for Android devices. We

**Table 1. Sociodemographic and Descriptive Characteristics of Study Sample (N = 640)**

Sociodemographic characteristics	No. (%) <sup>a</sup>
Age, mean (SD), y	15.29 (0.90)
Sex	
Female	261 (40.8)
Male	379 (59.2)
Race <sup>b</sup>	
American Indian/Alaska Native	5 (0.8)
Asian	11 (1.7)
Black (African American)	79 (12.3)
More than 1 race	79 (12.3)
Native Hawaiian or Other Pacific Islander	3 (0.5)
Other (unknown or not reported)	16 (2.5)
White	447 (69.9)
Ethnicity <sup>b</sup>	
Hispanic	120 (18.8)
Non-Hispanic	520 (81.2)
Household income, \$ <sup>c</sup>	
≤24 999	69 (10.8)
25 000-49 999	80 (12.5)
50 000-74 999	86 (13.4)
75 000-99 999	82 (12.8)
100 000-199 999	208 (32.5)
≥200 000	79 (12.3)

(continued)

constrained the sample to participants with 2 or more weekdays of data during school-day hours from select weeks between September 2022 to May 2024, excluding federal and school holidays. Problematic social media and mobile phone use were assessed using the SMAQ (Social Media Addiction Questionnaire) and MPIQ (Mobile Phone Involvement Questionnaire), respectively.<sup>6</sup> We used multivariable linear regression to examine whether sociodemographic characteristics and

**Table 1. Sociodemographic and Descriptive Characteristics of Study Sample (N = 640) (continued)**

Sociodemographic characteristics	No. (%) <sup>a</sup>	
Parents' highest education <sup>d</sup>		
High school education or less	86 (13.4)	
College education or more	553 (86.4)	
Smartphone or screen use variables	Mean (SD)	Median (IQR)
Self-reported problematic social media use (n = 636) <sup>e</sup>	1.84 (0.95)	1.50 (1.00-2.35)
Self-reported problematic mobile phone use (n = 637) <sup>f</sup>	3.32 (1.15)	3.43 (2.43-4.14)
Objective smartphone use, h (n = 640)		
24-h Smartphone use	4.93 (2.63)	4.58 (3.04-6.59)
24-h Social media app use	1.86 (1.90)	1.49 (0.07-3.09)
School-day smartphone use	1.16 (0.85)	0.97 (0.52-1.65)
School-day social media app use	0.40 (0.53)	0.18 (0.01-0.63)
Smartphone app category use during the school day, min <sup>g</sup>		
Social media (n = 518)	29.98 (32.69)	20.53 (4.47-44.81)
Video (n = 543)	14.84 (26.19)	4.11 (0.90-17.20)
Games (n = 526)	14.72 (19.56)	7.42 (2.22-18.28)
Communication (n = 634) <sup>h</sup>	9.01 (13.77)	4.01 (1.52-10.75)
Entertainment (n = 389)	6.00 (12.63)	0.84 (0.12-4.77)
Music (n = 508)	3.44 (9.82)	1.32 (0.40-3.27)
Tools (n = 615)	2.24 (3.88)	0.97 (0.34-2.54)
Photography (n = 574)	2.02 (4.25)	0.65 (0.23-2.16)
Education (n = 400)	1.56 (2.72)	0.72 (0.25-1.71)
Productivity (n = 454)	1.52 (3.04)	0.43 (0.14-1.45)

<sup>a</sup> Unless otherwise indicated. Participants were included if they provided 3 or more days overall and 2 or more school days of Effortless Assessment Research System data.

<sup>b</sup> Race and ethnicity based on report of the parent or caregiver from baseline (details available in the eMethods in Supplement 1).

<sup>c</sup> Nineteen participants (3.0%) responded "Don't know"; 17 (2.7%) declined to answer.

<sup>d</sup> One participant (0.2%) declined to answer.

<sup>e</sup> Determined from the Social Media Addiction Questionnaire. Scores represent the mean of 6 items rated on a 6-point Likert scale ranging from 1 (never) to 6 (very often); higher scores indicate more problematic social media use.

<sup>f</sup> Determined from the Mobile Phone Involvement Questionnaire. Scores represent the mean of 8 items rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree); higher scores indicate more problematic mobile phone use.

<sup>g</sup> Top 10 most used app categories in descending order of average minutes spent (only includes participants with any use).

<sup>h</sup> Communication category includes internet browsers (ie, Google Chrome).

**Table 2. Associations Between Sociodemographic Characteristics and Self-Reported Problematic Phone or Social Media Use With Objectively Measured Time Spent Using a Smartphone During School Hours (N = 640)<sup>a</sup>**

	Smartphone time during school day, min			Social smartphone time during school day, min		
	Adjusted mean (95% CI) <sup>b</sup>	Difference in mean (95% CI)	P value <sup>c</sup>	Adjusted mean (95% CI) <sup>b</sup>	Difference in mean (95% CI)	P value <sup>c</sup>
<b>Sociodemographic characteristics<sup>d</sup></b>						
Age, y						
13-15 [reference]	40.1 (4.7 to 75.4)			7.3 (-14.5 to 29.1)		
16-18	59.8 (24.7 to 94.9)	19.8 (11.8 to 27.7)	<.001	21.7 (-0.01 to 43.3)	14.4 (9.5 to 19.2)	<.001
Sex						
Male [reference]	52.8 (17.6 to 88.0)			13.3 (-8.4 to 35.1)		
Female	47.1 (11.9 to 82.3)	-5.7 (-13.5 to 2.1)	.15	15.6 (-6.1 to 37.4)	2.3 (-2.5 to 7.1)	.35
Race						
American Indian/Alaska Native	53.7 (8.2 to 99.2)	-8.2 (-57.0 to 40.6)	.74	19.5 (-8.6 to 47.6)	1.2 (-28.0 to 31.3)	.94
Asian	48.4 (1.6 to 95.1)	-13.6 (-42.9 to 15.8)	.37	11.5 (-17.4 to 40.3)	-6.8 (-25.0 to 11.3)	.46
Black (African American)	84.1 (45.8 to 122.3)	22.1 (9.1 to 35.2)	.001	30.6 (7.0 to 54.2)	12.3 (4.2 to 20.3)	.003
More than 1 race	51.7 (13.9 to 89.6)	-10.2 (-22.1 to 1.7)	.09	15.84 (-7.6 to 39.2)	-2.5 (-9.8 to 4.9)	.51
Native Hawaiian or Other Pacific Islander	18.9 (-48.2 to 86.0)	-43.1 (-100.0 to 13.9)	.14	3.8 (-37.7 to 45.2)	-14.6 (-49.7 to 20.6)	.42
Other (unknown or not reported)	31.0 (-12.9 to 74.9)	-31.0 (-57.5 to -4.4)	.02	1.9 (-25.2 to 29.0)	-16.4 (-32.8 to -0.04)	.0498
White [reference]	61.9 (25.2 to 98.7)			18.3 (-4.4 to 41.0)		
Ethnicity						
Hispanic	55.2 (19.9 to 90.5)	10.5 (-0.1 to 21.1)	.05	17.9 (-3.9 to 39.7)	6.8 (0.3 to 13.4)	.04
Non-Hispanic [reference]	44.7 (9.2 to 80.2)			11.1 (-10.8 to 33.0)		
Household income, \$						
≤24 999 [reference]	50.7 (14.0 to 87.4)			19.8 (-2.8 to 42.5)		
25 000-49 999	52.6 (16.0 to 89.3)	1.9 (-14.3 to 18.1)	.82	15.4 (-7.2 to 38.0)	-4.4 (-14.4 to 5.6)	.39
50 000-74 999	56.1 (20.8 to 91.5)	5.4 (-10.9 to 21.8)	.51	18.6 (-3.3 to 40.4)	-1.3 (-11.4 to 8.8)	.80
75 000-99 999	46.1 (9.9 to 82.2)	-4.7 (-21.7 to 12.4)	.59	9.4 (-12.9 to 31.7)	-10.4 (-20.9 to 0.1)	.05
100 000-199 999	33.5 (-2.27 to 69.3)	-17.2 (-32.5 to -1.9)	.03	5.1 (-17.0 to 27.2)	-14.7 (-24.2 to -5.3)	.002
≥200 000	33.3 (-3.3 to 69.9)	-17.4 (-34.9 to 0.1)	.05	9.9 (-12.8 to 32.5)	-10.0 (-20.8 to 0.8)	.07
Parent's highest education						
High school education or less [reference]	60.7 (45.6 to 75.8)			26.4 (17.1 to 35.7)		
College education or more	64.9 (51.7 to 78.0)	4.2 (-8.6 to 16.9)	.52	23.0 (14.9 to 31.1)	-3.4 (-11.3 to 4.5)	.40
<b>Self-reported problematic screen use variables<sup>e</sup></b>						
Problematic social media use <sup>f</sup>						
Low tertile [reference]	45.9 (10.4 to 81.4)			9.4 (-12.3 to 31.2)		
Middle tertile	50.8 (15.6 to 86.0)	4.9 (-4.5 to 14.2)	.31	15.7 (-5.9 to 37.2)	6.3 (0.5 to 12.0)	.03
High tertile	53.7 (18.1 to 89.3)	7.8 (-1.7 to 17.3)	.11	19.5 (-2.3 to 41.3)	10.1 (4.3 to 15.9)	<.001
Problematic mobile phone use <sup>g</sup>						
Low tertile [reference]	46.3 (10.7 to 81.8)			9.1 (-12.7 to 30.9)		
Middle tertile	48.9 (13.7 to 84.1)	2.6 (-6.6 to 11.8)	.58	16.7 (-5.0 to 38.2)	7.5 (1.8 to 13.2)	.01
High tertile	56.0 (20.4 to 91.6)	9.7 (0.2 to 19.2)	.046	15.9 (-6.0 to 37.7)	6.8 (0.9 to 12.6)	.02

<sup>a</sup> Participants were only included if they provided 3 or more days overall and 2 or more school days of Effortless Assessment Research System data.

<sup>b</sup> Adjusted means were calculated using the *emmeans* package in R.

<sup>c</sup> P values were 2-sided (P < .05).

<sup>d</sup> Analyses were multivariable regression models, in which each sociodemographic characteristic was adjusted for the 5 other sociodemographic characteristics.

<sup>e</sup> Analyses were multivariable regression models, adjusting for all sociodemographic characteristics.

<sup>f</sup> Determined from the Social Media Addiction Questionnaire. Scores represent the mean of 6 items rated on a 6-point Likert scale ranging from 1 (never) to 6 (very often); higher scores indicate more problematic social media use. Four participants had missing data (n = 636).

<sup>g</sup> Determined from the Mobile Phone Involvement Questionnaire. Scores represent the mean of 8 items rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree); higher scores indicate more problematic mobile phone use. Three participants had missing data (n = 637).

problematic screen use were associated with school-day smartphone use, the dependent variable. Testing was 2-sided, and P < .05 was considered statistically significant. Institutional review board approval was obtained from the University of California, San Diego, and each study site. Written informed consent and assent were obtained from guardians and children, respectively. Details are available in [Supplement 1](#).

**Results** | The study population of 640 adolescents had a mean age of 15.29 (SD, 0.90) years (59.2% male). The population was diverse in race, ethnicity, and socioeconomic status (**Table 1**). Adolescents spent a mean of 1.16 (SD, 0.85) hours using smartphones during school hours. The top 5 most-used app categories were social media, video, games, communication, and entertainment (**Table 1**). Adolescents spent the most time on social

media apps (eg, Instagram, TikTok, Snapchat; mean, 29.98 [SD, 32.69] minutes), followed by video apps (eg, YouTube; mean, 14.84 [SD, 26.19] minutes), and game apps (eg, Roblox, Clash Royale, Pokemon GO; mean, 14.72 [SD, 19.56] minutes). Later adolescence (16-18 vs 13-15 years old), Black (compared with White) race, and lower household income were associated with higher total school smartphone and social app time. Problematic social media use was positively associated with greater school smartphone time on social media apps (10.1 minutes [95% CI, 4.3-15.9]). Problematic mobile phone use was positively associated with greater school smartphone (9.7 minutes [95% CI, 0.2-19.2]) and social media app (6.8 minutes [95% CI, 0.9-12.6]) time (**Table 2**).

**Discussion** | This study found that US adolescents, on average, spent more than an hour using smartphones during school, with social media use accounting for most of that time. These objective findings from a large sample extend those of a prior smaller study, which similarly demonstrated 1 hour of smartphone usage per school day.<sup>4</sup>

This study observed disparities in school smartphone use. Black participants, compared with White participants, and participants from low-income households engaged with smartphones for 12 to 20 minutes more daily during school hours. Reasons for disparities were not assessed here but could include differences in school environments.

The ABCD-EARS app assessed only Android users; results may not generalize to iOS users. Additionally, this study did not account for school policy changes throughout 2022-2024. Because school smartphone regulations are rapidly changing, future periodic analyses are necessary to understand the evolving relationships between these policies, adolescent smartphone use, and long-term academic outcomes.

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