



Screen use in transgender and gender-questioning adolescents: Findings from the Adolescent Brain Cognitive Development (ABCD) Study

Jason M. Nagata^{a,*}, Priyadharshini Balasubramanian^a, Puja Iyra^a, Kyle T. Ganson^b, Alexander Testa^c, Jinbo He^d, David V. Glidden^e, Fiona C. Baker^{f,g}

^a Division of Adolescent and Young Adult Medicine, Department of Pediatrics, University of California, San Francisco, San Francisco, CA, USA

^b Factor-Inwentash Faculty of Social Work, University of Toronto, Toronto, Ontario, Canada

^c Department of Management, Policy and Community Health, University of Texas Health Science Center at Houston, TX, USA

^d School of Humanities and Social Science, The Chinese University of Hong Kong, 2001 Longxiang Boulevard, Longgang District, Shenzhen 518172, China

^e Department of Epidemiology and Biostatistics, University of California, San Francisco, San Francisco, CA, USA

^f Center for Health Sciences, SRI International, Menlo Park, 333 Ravenswood Ave, Menlo Park, CA 94025, USA

^g School of Physiology, University of the Witwatersrand, 1 Jan Smuts Ave, Braamfontein, Johannesburg 2017, South Africa

ARTICLE INFO

Keywords:

Screen time
LGBTQ+
Adolescent
Social media
Video games
Gender identity
Gender minority
Transgender

ABSTRACT

Objective: To assess the association between transgender or gender-questioning identity and screen use (recreational screen time and problematic screen use) in a demographically diverse national sample of early adolescents in the U.S.

Methods: We analyzed cross-sectional data from Year 3 of the Adolescent Brain Cognitive DevelopmentSM Study (ABCD Study®, N = 9859, 2019–2021, mostly 12–13-years-old). Multiple linear regression analyses estimated the associations between transgender or questioning gender identity and screen time, as well as problematic use of video games, social media, and mobile phones, adjusting for confounders.

Results: In a sample of 9859 adolescents (48.8% female, 47.6% racial/ethnic minority, 1.0% transgender, 1.1% gender-questioning), transgender adolescents reported 4.51 (95% CI 1.17–7.85) more hours of total daily recreational screen time including more time on television/movies, video games, texting, social media, and the internet, compared to cisgender adolescents. Gender-questioning adolescents reported 3.41 (95% CI 1.16–5.67) more hours of total daily recreational screen time compared to cisgender adolescents. Transgender identification and questioning one's gender identity was associated with higher problematic social media, video game, and mobile phone use, compared to cisgender identification.

Conclusions: Transgender and gender-questioning adolescents spend a disproportionate amount of time engaging in screen-based activities and have more problematic use across social media, video game, and mobile phone platforms.

Introduction

Screen-based digital media is integral to the daily lives of adolescents in multifaceted ways [1] but problematic screen use (characterized by inability to control usage and detrimental consequences from excessive use including preoccupation, tolerance, relapse, withdrawal, and conflict) [2,3], has been linked with harmful mental and physical health outcomes, such as depression, poor sleep, and cardiometabolic disease

[4,5]. Transgender and gender-questioning adolescents (i.e., adolescents who are questioning their gender identity) experience a higher prevalence of bullying (adjusted prevalence ratio [aPR] 1.88 and 1.62), suicide attempts (aPR 2.65 and 2.26), and binge drinking (aPR 1.80 and 1.50), respectively, compared to their cisgender peers [6–10]. Transgender and gender-questioning adolescents may engage in screen-based activities that are problematic and associated with negative health outcomes but also in a way that is different from their cisgender peers in

Abbreviations: ABCD, Adolescent Brain Cognitive Development study; IRB, Institutional review board; MPIQ, Mobile Phone Involvement Questionnaire; SGM, Sexual and gender minority; SMAQ, Social Media Addiction Questionnaire; US, United States; UCSD, University of California, San Diego; VGAQ, Video Game Addiction Questionnaire.

* Correspondence to: 550 16th Street, 4th Floor, Box 0503, San Francisco, CA 94143, USA.

E-mail address: jason.nagata@ucsf.edu (J.M. Nagata).

<https://doi.org/10.1016/j.annepidem.2024.04.013>

Received 28 November 2023; Received in revised form 25 April 2024; Accepted 30 April 2024

Available online 6 May 2024

1047-2797/© 2024 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

order to form communities, explore health education about their gender identity, and seek refuge from isolating or unsafe environments [11].

One study found that sexual and gender minority (SGM) adolescents (e.g., lesbian, gay, bisexual, and transgender), aged 13–18 years old, spent an average of 5 h per day online, approximately 45 min more than non-SGM adolescents in 2010–2011 [12]. However, this study grouped SGM together as a single group, conflating the experiences of gender minorities (e.g., transgender, gender-questioning) with those of sexual minorities (e.g., lesbian, gay, bisexual), and the data are now over a decade old. In a nationally representative sample of adolescents aged 13–18 years old in the U.S., transgender adolescents had higher probabilities of problematic internet use than cisgender adolescents. However, this analysis did not measure modality-specific problematic screen use such as problematic social media, video game, or mobile phone use, which may further inform the function that media use plays in the lives of gender minority adolescents [13]. While this prior research provides important groundwork to understand screen time and problematic use in gender minority adolescents, gaps remain in understanding differences in screen time and specific modalities of problematic screen use in gender minority early adolescents.

Our study aims to address the gaps in the current literature by studying associations between transgender and gender-questioning identity and screen time across several modalities including recreational and problematic social media, video game, and mobile phone use in a large, national sample of early adolescents. We hypothesized that among early adolescents, transgender identification and questioning one's gender identity would be positively associated with greater recreational screen time and problematic screen use compared to cisgender identification.

Methods

We conducted a cross-sectional analysis of the Year 3 follow-up of the Adolescent Brain Cognitive Development (ABCD) Study (5.0 release), the most recent year with full data available and the highest prevalence of adolescents who identify as transgender or gender-questioning. The ABCD Study is the largest long-term longitudinal study of health and cognitive development in 11,875 children from 21 recruitment sites across the U.S. (baseline 2016–2018). The ABCD Study sample, recruitment, protocol, and measures have previously been described in detail [14]. Participants were mainly 12–13 years old during the 3-year follow-up, which was conducted between 2019 and 2021. Institutional review board (IRB) approval was received from the University of California, San Diego and the IRB of each respective study site for primary data collection, as well as the University of California, San Francisco for this secondary data analysis. Written assent was obtained from adolescent participants, and written informed consent was obtained from their caregivers.

Measures

Independent variable

Transgender and gender-questioning: Adolescents were asked a question about transgender identity: “Are you transgender?” Response options included: yes, maybe, no, don't understand the question, and decline to answer [15,16]. For the purposes of terminology in this study, participants who responded “yes” were considered transgender adolescents, those who responded “maybe” were considered gender-questioning adolescents, and those who responded “no” were considered cisgender adolescents. When referring to the “yes” and “maybe” transgender groups together, we used a more inclusive term “gender minority” given its use in past literature [6,15,17].

Dependent variables

Recreational screen use

Adolescents self-reported their recreational screen use for the following modalities by hours (0–24 h) and minutes (0–60 min) of use on a typical weekday and weekend: multi-player gaming, single-player gaming, texting, social media, video chatting, browsing the internet, and watching/streaming television shows or movies [18]. The total typical daily screen use was calculated as the weighted sum of hours/-minutes $([\text{weekday average} \times 5] + [\text{weekend average} \times 2])/7$ across all modalities as has been done previously [2,19].

Problematic screen use

Social Media Addiction Questionnaire (SMAQ): The six-question SMAQ was used to assess problematic social media use as reported by adolescents who had at least one social media account. The questions were modeled after the Bergen Facebook Addiction Scale [2,3,20], which assesses Facebook addiction (e.g., overuse, tolerance, relapse, conflict) in a questionnaire with a unidimensional factor structure. Its application has been extended to broader social media and video game addiction among high school and college students [21,22]. Examples include “I've tried to use my social media apps less but I can't” and “I've become stressed or upset if I am not allowed to use my social media apps.” Likert-type scale responses ranged from 1 (never) to 6 (very often). To quantify the extent of problematic social media use, a mean score was calculated for the items in the questionnaire, with higher scores indicating greater problematic use.

Video Game Addiction Questionnaire (VGAQ): The six-question VGAQ was used to assess problematic video game use as reported by the adolescent participants who reported video game use during the week or on weekends. The questions were also modeled after the Bergen Facebook Addiction Scale [23]. Example questions include “I feel the need to play video games more and more” and “I play video games so much that it has had a bad effect on my schoolwork or job.” Likert-type scale responses ranged from 1 (never) to 6 (very often). To quantify the extent of problematic video game use, a mean score was calculated for the items in the questionnaire, with higher scores indicating greater problematic use.

Mobile Phone Involvement Questionnaire (MPIQ): The eight-question MPIQ was designed to assess problematic mobile phone use as reported by adolescents who reported having mobile phones use [24]. This questionnaire was previously used in a study to evaluate smartphone dependence in relation to digital multitasking while doing schoolwork among U.S. high school students [25]. Examples include “I interrupt whatever else I am doing when I am contacted on my phone” and “I lose track of how much I am using my phone.” Likert-type scale responses ranged from 1 (strongly disagree) to 7 (strongly agree). To quantify the extent of problematic mobile phone use, a mean score was calculated for the items in the questionnaire, with higher scores indicating greater problematic use.

Statistical analyses

Data analyses were performed in 2023 using Stata 18 (StataCorp, College Station, TX) using a complete case analysis. Multiple linear regression analyses were conducted to estimate associations between transgender identification (“yes” compared to “no”) or gender-questioning (“maybe” compared to “no”) and recreational screen time (seven modalities in total) as well as three forms of problematic screen use (video game, social media, mobile phone), adjusting for potential confounders including the adolescent's age, sex assigned at birth, race/ethnicity, parent education, household income (all parent reported), and study site. We checked for effect modification of the associations by sex assigned at birth given prior research showing differences in mental

Table 1

Sociodemographic and screen time characteristics of Adolescent Brain Cognitive Development (ABCD) Study participants (N = 9859).

Sociodemographic and screen use characteristics	Mean (SD) / %
Age (years)	12.91 (0.65)
Sex assigned at birth (%)	
Female	48.8%
Male	51.2%
Race/ethnicity (%)	
White	52.4%
Latino / Hispanic	20.1%
Black	17.3%
Asian	5.5%
Native American	3.2%
Other	1.5%
Household income (%)	
Less than \$75,000	56.8%
\$75,000 and greater	43.2%
Parents' highest education (%)	
High school education or less	16.2%
College education or more	83.8%
Transgender identification (%)	
No	94.7%
Yes	1.0%
Maybe	1.1%
I don't understand the question	2.6%
Decline to answer	0.6%
Screen time	
Total recreational screen time	9.13 (8.87)
Television and movies	2.58 (2.31)
Single-player video games	1.27 (1.90)
Multi-player video games	1.54 (2.12)
Texting	1.15 (2.05)
Social media	1.28 (2.13)
Video chat	0.81 (1.76)
Browsing the internet	0.52 (1.10)
Problematic screen use measures	
Video Game Addiction Questionnaire Score*	2.21 (1.09)
Social Media Addiction Questionnaire Score†	2.08 (0.97)
Mobile Phone Involvement Questionnaire Score‡	3.34 (1.12)

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

* Asked among a subset who reported video game use (n = 7600)

† Asked among a subset who reported social media use (n = 5656)

‡ Asked among a subset who reported mobile use (n = 7367)

health and substance use by sex assigned at birth among transgender adolescents [26,27]. Propensity weights provided by the ABCD Study were applied to yield representative estimates based on key

demographic and socioeconomic distributions of early adolescents in the American Community Survey from the U.S. Census [28].

Results

In a sample of 9859 adolescents (48.8% female, 47.6% racial/ethnic minority), 1.0% were transgender (responding “yes” to the transgender question) and 1.1% were gender-questioning (responding “maybe” to the transgender question, Table 1).

Compared to cisgender adolescents, transgender adolescents reported 4.51 (95% CI 1.17–7.85) more hours of total screen time and reported higher time across all screen modalities except for video chat in adjusted models (Table 2). Furthermore, transgender identification was associated with higher problematic social media, video game, and mobile phone use compared to cisgender identification in adjusted models.

Screen use comparisons for gender-questioning adolescents (responding “maybe” compared to “no” for the transgender question) are shown in Table 3. Gender-questioning participants reported 3.41 (95% CI 1.16–5.67) more hours of total daily recreational screen time and higher problematic social media, video game, and mobile phone use scores compared to cisgender participants.

Given no evidence of significant effect modification by sex assigned at birth (all p for interaction >0.05), we did not stratify by sex assigned at birth in the main analyses; however, analyses stratified by sex assigned at birth are shown in Appendix A.

Discussion

In a demographically diverse, national sample, the present study found that transgender adolescents reported over four more hours of daily screen time than their cisgender peers. Transgender adolescents reported more time spent on all screen modalities except for video chat compared to cisgender adolescents. Notably, transgender and gender-questioning adolescents had higher problematic phone, social media, and video game use compared to cisgender adolescents.

The results of our study add to the literature by investigating how gender minority adolescents interact with digital technology. Previous work has found that SGM adolescents reported on average 45 more minutes of daily screen time than non-SGM adolescents [12]. Our study adds to this by centering around the historically understudied subgroup of transgender and gender-questioning early adolescents and finding much larger differences in transgender versus cisgender adolescents

Table 2

Screen use associations with transgender vs cisgender identification in the Adolescent Brain Cognitive Development (ABCD) Study.

	Unadjusted		Adjusted	
	B (95% CI)	p	B (95% CI)	p
Screen time				
Total recreational screen time	4.20 (1.10, 7.31)	0.008	4.51 (1.17, 7.85)	0.008
Television and movies	0.98 (0.35, 1.60)	0.002	0.82 (0.16, 1.49)	0.016
Single-player video games	0.51 (0.01, 1.01)	0.045	0.89 (0.36, 1.42)	0.001
Multi-player video games	0.33 (−0.52, 1.17)	0.449	0.96 (0.04, 1.87)	0.040
Texting	0.29 (0.20, 1.63)	0.408	0.81 (0.04, 1.59)	0.040
Social media	1.06 (0.32, 1.81)	0.005	0.83 (0.06, 1.61)	0.035
Video chat	−0.04 (−0.31, 0.24)	0.802	−0.30 (−0.55, −0.05)	0.020
Browsing the internet	0.44 (0.09, 0.79)	0.014	0.49 (0.12, 0.87)	0.010
Problematic screen use measures				
Video Game Addiction Questionnaire Score*	0.08 (−0.18, 0.35)	0.537	0.46 (0.19, 0.74)	0.001
Social Media Addiction Questionnaire Score†	0.45 (0.20, 0.70)	< 0.001	0.43 (0.17, 0.69)	0.001
Mobile Phone Involvement Questionnaire Score‡	0.43 (0.16, 0.70)	0.002	0.34 (0.07, 0.61)	0.012

Bold indicates $p < 0.05$. The estimated B coefficient in the cells represent abbreviated outputs from a series of linear regression models with transgender identification (yes vs no) as the independent variable and screen use (row header) as the outcome variable. Thus, the table represents the output from 22 different regression models in total (11 unadjusted and 11 adjusted). ABCD Study propensity weights were applied based on the American Community Survey from the US Census.

Adjusted models include the adolescent's age, sex assigned at birth, race/ethnicity, household income, parent education (all parent reported), and study site.

* Asked among a subset who reported video game use

† Asked among a subset who reported social media use

‡ Asked among a subset who reported mobile use

Table 3
Screen use associations with questioning one’s gender identity vs cisgender identification in the Adolescent Brain Cognitive Development (ABCD) Study.

	Unadjusted		Adjusted	
	B (95% CI)	p	B (95% CI)	p
Screen time				
Total recreational screen time	2.37 (0.23, 4.52)	0.030	3.41 (1.16, 5.67)	0.003
Television and movies	0.83 (0.22, 1.44)	0.008	1.12 (0.48, 1.77)	0.001
Single-player video games	0.17 (−0.23, 0.56)	0.414	0.43 (0.07, 0.78)	0.018
Multi-player video games	−0.14 (−0.61, 0.34)	0.576	0.47 (−0.05, 1.00)	0.079
Texting	0.38 (−0.30, 1.00)	0.565	0.33 (−0.38, 1.04)	0.362
Social media	0.51 (0.02, 0.99)	0.041	0.42 (−0.09, 0.93)	0.108
Video chat	0.15 (−0.39, 0.69)	0.580	0.14 (−0.45, 0.73)	0.637
Browsing the internet	0.50 (0.02, 0.98)	0.042	0.50 (−0.01, 1.01)	0.055
Problematic screen use measures				
Video Game Addiction Questionnaire Score*	0.28 (−0.03, 0.58)	0.077	0.57 (0.27, 0.88)	< 0.001
Social Media Addiction Questionnaire Score†	0.44 (0.20, 0.69)	< 0.001	0.46 (0.21, 0.71)	0.001
Mobile Phone Involvement Questionnaire Score‡	0.60 (0.29, 0.92)	< 0.001	0.56 (0.21, 0.90)	0.001

Bold indicates $p < 0.05$. The estimated B coefficient in the cells represent abbreviated outputs from a series of linear regression models with transgender identification (maybe vs no) as the independent variable and screen use (row header) as the outcome variable. Thus, the table represents the output from 22 different regression models in total (11 unadjusted and 11 adjusted). ABCD Study propensity weights were applied based on the American Community Survey from the US Census. Adjusted models include the adolescent’s age, sex assigned at birth, race/ethnicity, household income, parent education (all parent reported), and study site.

* Asked among a subset who reported video game use
† Asked among a subset who reported social media use
‡ Asked among a subset who reported mobile use

than previously reported.

Our study also adds descriptive nuance to the specific modalities of screen use among transgender and gender-questioning adolescents. Higher watching of TV shows/movies among transgender and gender-questioning adolescents has not been previously discussed in the literature, with most research focusing on social media use or media representation. Moreover, the elevated single-player video game utilization in transgender and gender-questioning adolescents compared to cisgender adolescents may be explained by the phenomenon that gender minority adolescents are more likely to use media as a mode of escapism [29,30], and as an outlet for seeking out safety, engagement, and a sense of agency [31].

Our results also show that transgender and gender-questioning adolescents have higher rates of problematic video game use than cisgender adolescents. These findings are amplified by previous research that problematic video game use among gender minority adolescents is more significant at a younger age and associated with depression and interpersonal conflict [32].

Similarly, we also found that transgender and gender-questioning adolescents report higher problematic social media and mobile phone use compared to their cisgender peers. Previous work has shown that gender minority adolescents report higher problematic internet use, characterized by internet-related anxiety, withdrawal, or decreased motivation [30]. For gender minority adolescents, digital media may offer a nuanced duality, consisting of both problematic and resilience factors [30,33]. One study found that among SGM young adults, higher problematic social media use was associated with depressive symptoms, internalized stigma, and less emotional support [34]. Conversely, another study focusing solely on gender minority adolescents aged 10–17 found that active social media use and cleaning/curating social media were associated with lower emotional problems and conduct issues [33]. Social media has been shown to provide social support networks and online communities for SGM adolescents and young adults [35–37].

Despite the strengths of our study, several limitations should be noted. Given the cross-sectional nature of this study, temporality and causality of the associations cannot be determined. Additionally, problematic screen use was assessed via self-report survey, which is subject to reporting bias. The gender identity question focused on transgender

identity and did not capture other diverse gender minority identities (e.g., nonbinary, genderqueer, etc.). Moreover, those who responded “maybe” to the question regarding transgender status were analyzed separately. It is difficult to assess if these adolescents did not understand the questions or are truly gender questioning; however, given the developmental stage of the population being studied, we would expect a greater proportion of adolescents aged 12–13 to explore nonnormative gender identity more fluidly as compared to older adolescents [38,39]. Additionally, the time period for data collection included before and during the COVID-19 pandemic, when screen time increased substantially [40]. There could be differential impacts of the pandemic by geographic region due to differences in pandemic restrictions; therefore, we controlled for study site in the analyses which may help to account for some of these potential differences. This present study adds to the literature by studying a large, diverse, national dataset of younger (aged 12–13) transgender and gender-questioning adolescents that investigates overall screen time, subtype screen time, and problematic use behaviors.

Conclusion

Our findings support the need for digital media technology interventions to be scaffolded and tailored to the unique needs of gender minority adolescents. Given the differential uses and functions of screen time for gender minority adolescents, school media literacy programs can meaningfully support and empower adolescents through their identity formation journeys. The literature has shown that strong school media literacy programs were associated with less depression among gender minority adolescents, highlighting the importance of institutionalized media skill-building for youth [33]. Our findings should be interpreted with thought and deliberation given that there is a complex nuance to how gender minority adolescents interact with screen-based media and how it may be associated with both negative and positive outcomes. Further research should focus on the specific online activities in which gender minority adolescents engage and the function of these digital interactions. Moreover, future studies that analyze other measures of gender (e.g., gender expression, contentedness [16]), other adolescent age groups, and intersections with sexual orientation [41], may shed light on differences in screen time by developmental stage and

offer insight into differential associations with mental and physical health outcomes across adolescence.

Ethics approval

The University of California, San Diego provided centralized institutional review board (IRB) approval and each participating site received local IRB approval. The University of California, San Francisco provided additional approval for this secondary data analysis.

Funding

J.M.N. was funded by National Institutes of Health (K08HL159350 and R01MH135492) and the Doris Duke Charitable Foundation (2022056). The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The ABCD Study was supported by the National Institutes of Health (Bethesda, Maryland) and additional federal partners under award numbers U01DA041022, U01DA041025, U01DA041028, U01DA041048, U01DA041089, U01DA041093, U01DA041106, U01DA041117, U01DA041120, U01DA041134, U01DA041148, U01DA041156, U01DA041174, U24DA041123, and U24DA041147. A full list of supporters is available at <https://abcdstudy.org/federal-partners/>. A listing of participating sites and a complete listing of the study investigators can be found at <https://abcdstudy.org/principal-investigators.html>. ABCD consortium investigators designed and implemented the study and/or provided data but did not necessarily participate in the analysis or writing of this report.

CRediT authorship contribution statement

Jason M. Nagata: Conceptualization, Formal analysis, Supervision, Writing – original draft, Writing – review & editing. **Priyadharshini Balasubramanian:** Formal analysis, Writing – original draft, Writing – review & editing. **Puja Iyara:** Writing – original draft, Writing – review & editing. **Kyle T. Ganson:** Writing – review & editing. **Alexander Testa:** Writing – review & editing. **Jinbo He:** Writing – review & editing. **David V. Glidden:** Writing – review & editing. **Fiona C. Baker:** Conceptualization, Investigation, Methodology, Writing – review & editing.

Declaration of Competing Interest

The authors have no conflict to declare.

References

- [1] Twenge JM, Martin GN, Spitzberg BH. Trends in U.S. Adolescents' media use, 1976–2016: the rise of digital media, the decline of TV, and the (near) demise of print. *Psychol Pop Media Cult* 2019;8:329–45. <https://doi.org/10.1037/ppm0000203>.
- [2] Nagata JM, Singh G, Sajjad OM, Ganson KT, Testa A, Jackson DB, et al. Social epidemiology of early adolescent problematic screen use in the United States. *Pedia Res* 2022;92:1443–9. <https://doi.org/10.1038/s41390-022-02176-8>.
- [3] Andreassen CS, Torbjørn T, Brunborg GS, Pallesen S. Development of a Facebook addiction scale. *Psychol Rep* 2012;110:501–17. <https://doi.org/10.2466/02.09.18.PR0.110.2.501-517>.
- [4] Stiglic N, Viner RM. Effects of screentime on the health and well-being of children and adolescents: a systematic review of reviews. *BMJ Open* 2019;9:e023191. <https://doi.org/10.1136/bmjopen-2018-023191>.
- [5] Shannon H, Bush K, Villeneuve PJ, Hellemans KG, Guimond S. Problematic social media use in adolescents and young adults: systematic review and meta-analysis. *JMIR Ment Health* 2022;9:e33450. <https://doi.org/10.2196/33450>.
- [6] Gonzales G, Deal C. Health risk factors and outcomes among gender minority high school students in 15 US States. *JAMA* 2022;327:1498–500. <https://doi.org/10.1001/jama.2022.3087>.
- [7] Salk RH, Thoma BC, Choukas-Bradley S. The gender minority youth study: overview of methods and social media recruitment of a nationwide sample of U.S. cisgender and transgender adolescents. *Arch Sex Behav* 2020;49:2601–10. <https://doi.org/10.1007/s10508-020-01695-x>.
- [8] Sterzing PR, Ratliff GA, Gartner RE, McGeough BL, Johnson KC. Social ecological correlates of polyvictimization among a national sample of transgender, genderqueer, and cisgender sexual minority adolescents. *Child Abuse Negl* 2017;67:1–12. <https://doi.org/10.1016/j.chiabu.2017.02.017>.
- [9] Collier KL, van Beusekom G, Bos HMW, Sandfort TGM. Sexual orientation and gender identity/expression related peer victimization in adolescence: a systematic review of associated psychosocial and health outcomes. *J Sex Res* 2013;50:299–317. <https://doi.org/10.1080/00224499.2012.750639>.
- [10] Toomey RB, Syvertsen AK, Shramko M. Transgender adolescent suicide behavior. *Pediatrics* 2018;142:e20174218. <https://doi.org/10.1542/peds.2017-4218>.
- [11] Selkie E, Adkins V, Masters E, Bajpai A, Shumer D. Transgender adolescents' uses of social media for social support. *J Adolesc Health* 2020;66:275–80. <https://doi.org/10.1016/j.jadohealth.2019.08.011>.
- [12] Out Online: The Experiences of LGBT Youth on the Internet. GLSEN n.d. (<https://www.glsen.org/news/out-online-experiences-lgbt-youth-internet>) (accessed September 25, 2023).
- [13] Allen BJ, Zhao Q, Moreno MA. Digital media use differs between transgender and cisgender youth. *Pediatrics* 2021;147:214–5. <https://doi.org/10.1542/peds.147.3MA3.214>.
- [14] Barch DM, Albaugh MD, Avenevoli S, Chang L, Clark DB, Glantz MD, et al. Demographic, physical and mental health assessments in the adolescent brain and cognitive development study: Rationale and description. *Dev Cogn Neurosci* 2018;32:55–66. <https://doi.org/10.1016/j.dcn.2017.10.010>.
- [15] Calzo JP, Blashill AJ. Child sexual orientation and gender identity in the adolescent brain cognitive development Cohort study. *JAMA Pedia* 2018;172:1090–2. <https://doi.org/10.1001/jamapediatrics.2018.2496>.
- [16] Potter AS, Dube SL, Barrios LC, Bookheimer S, Espinoza A, Feldstein Ewing SW, et al. Measurement of gender and sexuality in the Adolescent Brain Cognitive Development (ABCD) study. *Dev Cogn Neurosci* 2022;53:101057. <https://doi.org/10.1016/j.dcn.2022.101057>.
- [17] Potter A, Dube S, Allgaier N, Loso H, Ivanova M, Barrios LC, et al. Early adolescent gender diversity and mental health in the adolescent brain cognitive development study. *J Child Psychol Psychiatry* 2021;62:171–9. <https://doi.org/10.1111/jcpp.13248>.
- [18] Bagot KS, Matthews SA, Mason M, Squeglia LM, Fowler J, Gray K, et al. Current, future and potential use of mobile and wearable technologies and social media data in the ABCD study to increase understanding of contributors to child health. *Dev Cogn Neurosci* 2018;32:121–9. <https://doi.org/10.1016/j.dcn.2018.03.008>.
- [19] Nagata JM, Ganson KT, Iyer P, Chu J, Baker FC, Pettie Gabriel K, et al. Sociodemographic correlates of contemporary screen time use among 9- and 10-year-old children. *J Pedia* 2022;240:213–220.e2. <https://doi.org/10.1016/j.jpeds.2021.08.077>.
- [20] Bagot KS, Tomko RL, Marshall AT, Hermann J, Cummins K, Ksinan A, et al. Youth screen use in the ABCD® study. *Dev Cogn Neurosci* 2022;57:101150. <https://doi.org/10.1016/j.dcn.2022.101150>.
- [21] Hou Y, Xiong D, Jiang T, Song L, Wang Q. Social media addiction: its impact, mediation, and intervention. *Cyber: J Psychosoc Res Cyber* 2019;13. <https://doi.org/10.5817/CP2019-1-4>.
- [22] Simsek A, Elciyar K, Kizilhan T. A comparative study on social media addiction of high school and university students. *CONT ED Technol* 2019;10:106–19. <https://doi.org/10.30935/cet.554452>.
- [23] Andreassen CS, Torsheim T, Brunborg GS, Pallesen S. Development of a Facebook addiction scale. *Psychol Rep* 2012;110:501–17. <https://doi.org/10.2466/02.09.18.PR0.110.2.501-517>.
- [24] Walsh SP, White KM, Young RM. Needing to connect: the effect of self and others on young people's involvement with their mobile phones. *Aust J Psychol* 2010;62:194–203. <https://doi.org/10.1080/00049530903567229>.
- [25] Mrazek AJ, Mrazek MD, Ortega JR, Ji RR, Karimi SS, Brown CS, et al. Teenagers' smartphone use during homework: an analysis of beliefs and behaviors around digital multitasking. *Educ Sci* 2021;11.
- [26] Watson RJ, Fish JN, McKay T, Allen SH, Eaton L, Puhl RM. Substance use among a national sample of sexual and gender minority adolescents: intersections of sex assigned at birth and gender identity. *LGBT Health* 2020;7:37–46. <https://doi.org/10.1089/lgbt.2019.0066>.
- [27] Klinger D, Riedl S, Zesch HE, Oehlke S-M, Völkl-Kernstock S, Plener PL, et al. Mental health of transgender youth: a comparison of assigned female at birth and assigned male at birth individuals. *J Clin Med* 2023;12:4710. <https://doi.org/10.3390/jcm12144710>.
- [28] Heeringa S, Berglund P. A guide for population-based analysis of the Adolescent Brain Cognitive Development (ABCD) study baseline data. *bioRxiv* 2020:2020.02.10.942011. (<https://doi.org/10.1101/2020.02.10.942011>).
- [29] Allen BJ, Zhao Q, Moreno MA. Digital media use differs between transgender and cisgender youth. *Pediatrics* 2021;147:214–5. <https://doi.org/10.1542/peds.147.3MA3.214>.
- [30] Allen BJ, Stratman ZE, Kerr BR, Zhao Q, Moreno MA. Associations between psychosocial measures and digital media use among transgender youth: cross-sectional study. *JMIR Pedia Parent* 2021;4:e25801. <https://doi.org/10.2196/25801>.
- [31] O'Brien RT, Gagnon KW, Egan JE, Coulter RWS. Gaming preferences and motivations among bullied sexual and gender minority youth: an interview study. *Games Health J* 2022;11:79–84. <https://doi.org/10.1089/g4h.2021.0059>.
- [32] Arcelus J, Bouman W.P., Jones B.A., Richards C., Jimenez-Murcia S., Griffiths M. D. Video gaming and gaming addiction in transgender people: An exploratory study. *J Behav Addict* n.d.;6:21–29. (<https://doi.org/10.1556/2006.6.2017.002>).
- [33] Coyne SM, Weinstein E, Sheppard JA, James S, Gale M, Alfen MV, et al. Analysis of Social Media Use, Mental Health, and Gender Identity among US youths. *JAMA Netw Open* 2023;6. <https://doi.org/10.1001/jamanetworkopen.2023.24389>.

- [34] Vogel EA, Ramo DE, Prochaska JJ, Meacham MC, Layton JF, Humfleet GL. Problematic social media use in sexual and gender minority young adults: observational study. *JMIR Ment Health* 2021;8:e23688. <https://doi.org/10.2196/23688>.
- [35] Gordon JD, Whitfield DL, Mammadli T, Escobar-Viera CG. Social support-seeking strategies on social media at the intersection of lesbian, gay, bisexual, transgender, and queer identity, race, and ethnicity: insights for intervention from a qualitative study. *JMIR Form Res* 2023;7:e51702. <https://doi.org/10.2196/51702>.
- [36] Berger MN, Taba M, Marino JL, Lim MSC, Cooper SC, Lewis L, et al. Social media's role in support networks among LGBTQ adolescents: a qualitative study. *Sex Health* 2021;18:421–31. <https://doi.org/10.1071/SH21110>.
- [37] Berger MN, Taba M, Marino JL, Lim MSC, Skinner SR. Social media use and health and well-being of lesbian, gay, bisexual, transgender, and queer youth: systematic review. *J Med Internet Res* 2022;24:e38449. <https://doi.org/10.2196/38449>.
- [38] Boskey ER. Understanding transgender identity development in childhood and adolescence. *Am J Sex Educ* 2014;9:445–63. <https://doi.org/10.1080/15546128.2014.973131>.
- [39] Steensma TD, Kreukels BPC, de Vries ALC, Cohen-Kettenis PT. Gender identity development in adolescence. *Horm Behav* 2013;64:288–97. <https://doi.org/10.1016/j.yhbeh.2013.02.020>.
- [40] Nagata JM, Cortez CA, Cattle CJ, Ganson KT, Iyer P, Bibbins-Domingo K, et al. Screen time use among U.S. adolescents during the COVID-19 pandemic: findings from the Adolescent Brain Cognitive Development (ABCD) study. *JAMA Pediatr* 2022;176:94–6. <https://doi.org/10.1001/jamapediatrics.2021.4334>.
- [41] Nagata JM, Lee CM, Yang J, Al-Shoaibi AAA, Ganson KT, Testa A, Jackson DB. Associations between sexual orientation and early adolescent screen use: findings from the Adolescent Brain Cognitive Development (ABCD) Study. *Ann Epidemiol* 2023;82:54–58.e1. <https://doi.org/10.1016/j.annepidem.2023.03.004>.