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IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

NetChoice, LLC, Plaintiff, **v.** **Rob Bonta, in his official capacity as Attorney General of the State of California,** Defendant.	Case No. 5:22-cv-08861-BLF **DECLARATION OF JENNY S. RADESKY, MD IN SUPPORT OF DEFENDANT'S OPPOSITION TO PLAINTIFF'S MOTION FOR A SECOND PRELIMINARY INJUNCTION** Date: January 23, 2025 Time: 9:00 a.m. Dept: 3 Judge: The Honorable Beth Labson Freeman Trial Date: Not scheduled Action Filed: 12/14/2022

I, Jenny S. Radesky, MD, declare and state as follows:

I submit this declaration in support of Defendant's Opposition to Plaintiff's Motion for Second Preliminary Injunction.

BACKGROUND & QUALIFICATIONS

1. I am a tenured Associate Professor of Pediatrics and Director of the Division of Developmental Behavioral Pediatrics at University of Michigan Medical School and C.S. Mott Children's Hospital. In this role, I lead a team of 11 clinicians and researchers who aim to understand, treat, and advocate for children's developmental, emotional, and educational needs. This work requires theoretical and practical knowledge about child development, parent-child relationships, and the ways children's individual differences – such as mood regulation, executive functioning, trauma exposure, or social skills – shape the way they interact with their families and environments.

2. I am a board-certified practicing Developmental Behavioral Pediatrician with clinical expertise in developmental delays, autism spectrum disorder, attention deficit hyperactivity disorder, mood dysregulation, disruptive behavior disorders, learning disabilities, intellectual disability, parent-child relational problems, and trauma/stressor-related disorders. I work closely with legal advocates, clinical psychologists, special educators, and outpatient therapists to coordinate care for complex patients, and therefore understand the multiple levels of children's experiences that contribute to their health and well-being.

3. I have been researching and publishing in the field of child social-emotional development and digital media for the past 15 years. My research areas include: 1) how early childhood media use is linked with emotion regulation and executive functioning; 2) how parent smartphone use affects parenting stress, parent-child interaction, and child social-emotional development; 3) how parents and children use mobile devices, which we study using passive sensing methods to capture data directly from smartphones and tablets; 4) analysis of educational content/interactive design, including manipulative "dark pattern" design, in apps and platforms popular with children; 5) assessment of the amount, type, and design of advertising in apps and platforms used by children; 6) examination of data collection by apps used by young children,

and how this differs by child socioeconomic status; and 7) interviewing parents and children about their conceptualizations of digital privacy and persuasive design. I also mentor a number of pediatric trainees and doctoral students who study topics including smart home design, child-computer interaction (i.e., how different design affordances influence child behavior and parent-child interaction), and children's interactions with artificial intelligence.

4. I have published 73 peer-reviewed articles (in addition to 4 under review or in press), many in high-impact journals such as *Journal of the American Medical Association, Pediatrics*, *JAMA Pediatrics*, and *Pediatric Research.* I have also published 18 non-peer-reviewed articles, 7 book chapters, and am the editor of a developmental behavioral pediatrics textbook, *Encounters with Children, 5th Edition* (to be published in 2025). My published research has been cited 12,983 times, and my current h-index is 40 (i10-index 61).

5. I founded and run a research program on children and media at the University of Michigan Medical School, studying how modern forms of digital media – including smartphones, tablets, interactive apps, mobile games, advertising, and video-sharing platforms like YouTube – and their unique design affordances influence child social-emotional development. I have a strong track record of funding from the Eunice Kennedy Shriver National Institute of Child Health and Development (NICHD), including: a K23 Career Development Award in 2017 ($831,232), which is a 5-year award providing research training; an R03 award ($155,584) in 2018 examining how design affordances of interactive media shape parent-toddler verbal and social interactions; an R21 award ($427,750) in 2018 examining mobile device use and social-emotional development in 3-4-year-olds; and an R41 Scientific Technology Transfer Research award from NICHD ($150,000) to develop a passive sensing app, Chronicle, which I use in my research to measure app and device usage by children and parents. I currently am funded by two large-scale grants from NICHD, including an R01 award ($3,538,615) that examines associations of media use with executive functioning development in toddlers, and a P01 multi-site award ($279,142) and supplement ($28,409). Over the past 8 years, I have also received funding from several internal university grants, nonprofit organizations like Common Sense Media and the Boston Children's Hospital Digital Wellness Lab, and the Blue Cross Blue Shield Foundation. As a researcher, I

understand the ethical and privacy standards around collection, storage, and destruction of sensitive data about children.

6. Throughout my research career, I have sought cross-disciplinary collaborations with computer engineers, information scientists, privacy researchers, developmental psychologists, public health researchers, and policy-oriented researchers in the United States (U.S.) and internationally, so that my research can reflect the complex ways children interact with modern media. Through these collaborations, my knowledge has extended beyond pediatrics into understanding data collection and marketing methods, how app-based data is collected and stored, monetization practices (e.g., in-app purchases, advertising) used in digital products, and how policy changes might impact business practices.

7. I have intentionally designed my research studies so that they can easily be translated into practical parenting approaches or policies. My research has directly informed the Bright Futures Guidelines for Pediatric Health Supervision, multiple American Academy of Pediatrics (AAP) policy statements, and petitions and complaints to the Federal Trade Commission (FTC) regarding manipulative advertising and interactive design in children's apps, and it has been cited in U.S. Congressional testimony.

8. I have also served in a leadership role at the AAP since 2015, when I was recruited to join the Executive Committee of the AAP Council on Communications and Media. I was lead author on two AAP policy statements – *Media and Young Minds* (2016)[1] and *Digital Advertising to Children* (2020)[2] – which included exhaustive reviews of the research literature on children and digital media. I am Chair of the Council on Communications and Media. Under my leadership, the AAP has broadened its digital media guidance to not only recommend behavior change by pediatric clinicians and families, but also recommend changes in technology policy and digital design.

9. Through the AAP and as an independently-solicited research and clinical expert, I have provided guidance to parents about healthy relationships with technology through my work

[1] Radesky, Jenny and Christakis, Dimitri. (2016). "Media and young minds." *Pediatrics* 138.5.
[2] Radesky, Jenny, et al. (2020) "Digital advertising to children." *Pediatrics* 146.1.

with HealthyChildren.org, PBS Parents, Common Sense Media, and CNN. I also designed the AAP Family Media Plan, an online tool to help parents develop balanced relationships with media. My work has been referenced in U.S. and international media outlets, including Time Magazine, the New York Times, WIRED, CBS News and NPR, among others, and I have been a guest on the TODAY Show twice to discuss my expertise. I offered guidance specific to families coping during the COVID-19 pandemic through my work with Noggin, Scary Mommy, Common Sense Media, and the University of Michigan C.S. Mott Children's Hospital.

10. I also serve as the Co-Medical Director of the AAP's Center of Excellence on Social Media and Youth Mental Health. This Center was founded in 2022 and funded by the Substance Abuse and Mental Health Services Administration to create and disseminate resources on healthy social media use to teens, caregivers, teachers, clinicians, and others who support youth wellbeing. However, resources are not enough. As a Center of Excellence leader, I have heard repeatedly from parents, academics, and other experts that **technology design change is needed to improve children and teens' mental health online**, rather than expecting children and families to shoulder all the burden. This message is prominent in the 2023 National Academies of Science report *Social Media and Adolescent Health*,[3] the U.S. Surgeon General's Advisory on social media and mental health,[4] and the Biden-Harris Interagency Task Force on Kids Online Health and Safety report published in July 2024.[5]

11. Since July 2024, I have served as a Behavioral Expert for the U.S. Federal Trade Commission (FTC) through an Intergovernmental Personnel Agreement with the University of Michigan. In this governmental role, I advise FTC teams on enforcement of the Children's Online Privacy Protection Act and Section 5 of the FTC Act. Through this experience, I have built greater understanding of the policy landscape and how design decisions – or lack of appropriate oversight or transparency of digital products used by minors – impact user health and wellbeing.

[3] National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27396.

[4] Social Media and Youth Mental Health: The U.S. Surgeon General's Advisory (2023). https://www.hhs.gov/sites/default/files/sg-youth-mental-health-social-media-advisory.pdf

[5] Online Health and Safety for Children and Youth: Best Practices for Families and Guidance for Industry. Kids Online Health and Safety Task Force (2024). https://www.samhsa.gov/sites/default/files/online-health-safety-children-youth-report.pdf

12. Based on my expertise in children and digital technology, I am regularly invited to speak at both medical and technological conferences nationally and internationally. I have been invited to give Grand Rounds at children's hospitals around the U.S., regularly give plenary lectures at pediatric conferences in the U.S. and internationally (Switzerland, Slovenia), and have been asked to train early childhood providers throughout the U.S., Canada, and internationally (Italy, Denmark, Hong Kong, United Arab Emirates). I have also been invited to speak at conferences with technology industry audiences, including Common Sense Media and the MIPCOM Conference (Cannes, France).

13. I am regularly asked to speak to government bodies on issues related to children's health and technology. My experience providing testimony includes: Michigan State Senate Committee on Education in April 2021 regarding children's mental health and remote schooling; U.S. House of Representatives Subcommittee on Health of the Committee on Energy and Commerce in October 2021 regarding children's health and technology; and an informational hearing for California Assembly Committee on Privacy and Consumer Protection and Arts, Entertainment, Sports, Tourism, and Internet Media in March 2022 about children and digital technology. I have been an invited speaker at Federal Trade Commission Workshops about children's online privacy (October 2019), dark patterns (April 2021), and stealth advertising (October 2022).

14. I was also recently appointed to the Board on Children, Youth, and Families for the National Academies of Science, Medicine, and Engineering.

15. I am on the Steering Committee for Designed with Kids in Mind, a coalition of groups committed to the wellbeing of children and online users across the U.S. This work puts me in frequent contact with other experts in my field. I also collaborate with experts in the United Kingdom (U.K.), European Union (E.U.), and colleagues who work in the technology industry.

16. I have served on advisory boards for two for-profit companies, the scientific advisory board for Noggin/CBS and the Board of Directors for Melissa & Doug toys. This work required understanding the ways companies identify their audiences/consumers, child-centered approaches in digital and non-digital product design, and how companies approach marketing and

data collection.

17. My medical training at Harvard Medical School prepared me to understand complex social, cultural, psychological, and technological determinants of health in parents and children. At Harvard, I completed additional coursework in public health and epidemiology and an honors thesis focusing on preventive health. I completed my pediatrics residency at Seattle Children's Hospital between 2007 and 2010, when mobile technologies were first bursting onto the market and into family life. I witnessed smartphones, tablets, and mobile apps being introduced into family communication and routines as a primary care pediatrician in 2010-2011, working at a clinic that served many families working in Seattle's tech sector. I then completed subspecialty fellowship training in Developmental Behavioral Pediatrics at Boston Medical Center, New England's largest safety-net hospital, from 2011-2014, which solidified my expertise in child development, parent-child relationships, and the systems that shape child wellbeing.

18. My *curriculum vitae*, which sets forth my experience and credentials more fully, is attached as Exhibit A.

19. I am being compensated in the above-entitled case at an hourly rate of $400/hour for preparing this declaration. My compensation is not in any way dependent on the outcome of this or any related proceeding.

20. The opinions in this declaration are my expert opinions, which are based on my clinical and research expertise in developmental behavioral pediatrics, public health, and media research; my experience reviewing the scientific literature about children and digital technology and writing AAP policy statements; my experience translating the scientific literature for teaching parents and professionals nationally and internationally; my experience as a board member at for-profit companies; and my conversations with domestic and international experts doing work at the intersection of technology and child development. My testimony represents my expertise as a pediatrician and researcher, not the views of the University of Michigan, American Academy of Pediatrics, or U.S. Federal Trade Commission.

21. I have reviewed AB 2273, the California Age-Appropriate Design Code Act. In my expert opinion, it is a necessary piece of legislation to reduce harms, ensure that children have

opportunities to participate in age-appropriate digital spaces, and minimize the manipulative and egregious designs that serve industry needs at the expense of child wellbeing.

ONLINE HARMS TO MINORS

Global Consensus About Online Harms

22. It is widely accepted that online harms to minors occur and need to be mitigated. In this section, I describe several different harm frameworks that have informed policy decisions globally. In subsequent sections, I will describe the frequency of these harms in U.S. minors and how harms are brought about by specific design features on digital platforms.

23. The Organization for Economic Cooperation and Development (OECD), of which the U.S. is a member, has established a leading framework recognizing harms from 1) Content, 2) Contact, 3) Conduct, and 4) Contract/Commercial sources. They also name cross-cutting harms that exist across these categories, including privacy invasions, predictive analytics, and risks to health and wellbeing.[6] This framework is also recognized by the European Commission.[7] Most recently, the OECD published a report on *Children in the Digital Environment* stating that the digital world exposes children to a range of harms and design safeguards are needed.[8]

24. The World Economic Forum's Global Coalition for Digital Safety released a taxonomy of online harms in 2023 that describes how digital products amplify preexisting social harms for adult and child users. These harms include threats to personal and community safety; harm to health and well-being; hate and discrimination; violation of dignity; invasion of privacy; and deception and manipulation.[9]

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[6] Organization for Economic Cooperation and Development (2020). Protecting Children Online: An Overview of Recent Developments in Legal Frameworks and Policies. OECD Digital Economy Papers, No. 295. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/06/protecting-children-online_0c385619/9e0e49a9-en.pdf

[7] Livingstone, S., & Stoilova, M. (2021). The 4Cs: Classifying Online Risk to Children. (CO:RE Short Report Series on Key Topics). Hamburg: Leibniz-Institut für Medienforschung | Hans-Bredow-Institut (HBI); CO:RE - Children Online: Research and Evidence. https://doi.org/10.21241/ssoar.71817

[8] Organization for Economic Cooperation and Development. Children in the Digital Environment. Available at: https://www.oecd.org/en/topics/children-in-the-digital-environment.html

[9] World Economic Forum. Toolkit for Digital Safety Design Interventions and Innovations: Typology of Online Harms. Insight Report, August 2023. Available at: https://www3.weforum.org/docs/WEF_Typology_of_Online_Harms_2023.pdf

25. In spring 2023, the American Psychological Association[10] and the Office of the U.S. Surgeon General[11] released advisories regarding social media and youth mental health. These reports reviewed research on several harms related to social media use in particular, including 1) problematic/excessive social media use, 2) sleep disruption, 3) bullying/harassment, and 4) negative social media content.

26. The National Academies of Sciences, Engineering, and Medicine (NASEM) conducted a consensus study released in December 2023 entitled *Social Media and Adolescent Health* that involved an in-depth review of published research and input from international scholars.[12] The adolescent health and wellbeing harms enumerated in this report included: 1) negative social comparison, 2) displacement of healthy activities, 3), sleep disruption, 4) interference with attention and learning, 5) overuse and problematic social media use, 6) sexual exploitation, and 7) digital abuse such as cyberbullying.

27. The Biden-Harris Interagency Task Force on Kids Online Health and Safety involved a comprehensive review of research literature in addition to listening sessions with families, youth, and experts across the nation. The Task Force Report, released in July 2024, affirmed the child harm risks described in the NASEM report and provided additional focus on several topic areas that were raised during their nationwide information gathering: 1) problematic/excessive technology use, 2) cyberbullying and online harassment, 3) bias and discrimination, 4) sexual exploitation and abuse, and 5) privacy risks.

28. **Thus, there is national and global consensus that harm can result from digital platform use in minors.** Although harm categories range from broad constructs (e.g., Content, Contact, Cross-cutting health harms, etc.) as in global frameworks to specific constructs (e.g., problematic media use) as in recent U.S. health and scientific publications, they encompass the same child and teen experiences. In this testimony, I focus on the harms to minors that can be tied

[10] American Psychological Association (2023). Health Advisory on Social Media Use in Adolescence. Available at: https://www.apa.org/topics/social-media-internet/health-advisory-adolescent-social-media-use.pdf

[11] Social Media and Youth Mental Health: The U.S. Surgeon General's Advisory (2023). https://www.hhs.gov/sites/default/files/sg-youth-mental-health-social-media-advisory.pdf

[12] National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27396.

to design features and digital privacy concepts relevant to the California Age-Appropriate Design Code.

Frequency of Online Harms to Minors

29. Online harms to minors vary in their **prevalence** and the **magnitude of effect** that they have on a child or teen's mental health. For example, experiences such as negative social comparison during social media use have a smaller effect on a child's depressed or anxious feelings,[13] but are highly prevalent. Since these harms are more common, they may cause small but meaningful shifts in minors' wellbeing across the whole population. Moreover, effects are heterogeneous, meaning they are not uniform across all users: some teens with mental health vulnerabilities will be more negatively impacted by negative social comparison than others.[14] In contrast, experiences such as sexual exploitation have a large negative impact on a child's or teen's mental health but have lower prevalence throughout the population. Both lower-impact high-prevalence harms and high-impact lower-prevalence harms are important to address because they shift the trajectory of child and teen wellbeing. The following paragraphs address specific harms that have been linked to online activity.

30. **Cyberbullying/online abuse** has been reported by nearly half (46%) of U.S. teens, including 32% reporting offensive name-calling; 22% having false rumors spread about them; 17% receiving explicit images they didn't ask for; 15% constantly being asked by someone other than a parent where they are, what they are doing, or who they are with; 10% receiving physical threats; and 7% having explicit images of them shared without their consent.[15] In this survey from Pew Research Center, 74% of teens thought that digital platforms need to do more to prevent online bullying.[16]

31. Rates are even higher among gamers, with 60% of 13-17-year-olds reporting any online harassment while playing online multiplayer video games, including mobile games. This

[13] Cunningham, S., Hudson, C. C., & Harkness, K. (2021). Social media and depression symptoms: a meta-analysis. *Research on child and adolescent psychopathology*, *49*(2), 241-253.

[14] National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27396.

[15] Vogels, E. 2022. Teens and cyberbullying 2022. Pew Research Center. https://www.pew research.org/internet/2022/12/15/teens-and-cyberbullying-2022/

[16] *Ibid.*

includes 33% reporting their gameplay interrupted by trolling/"griefing" (defined as deliberate attempts to upset or provoke someone); 29% called offensive names; 19% hearing negative things based on their avatar's appearance, username, or in-game possessions; 17% annoyed or bullied over multiple sessions; 15% personally embarrassed by another player; and 12% excluded from a game or chat because of their identity.[17] In 2024 data on U.S. teens' video game experiences from the Pew Research Center, a significant number say they have been called an offensive name (48% of boys, 32% of girls), physically threatened (15% of boys, 9% of girls), or sent unwanted sexually explicit things (7% of boys, 10% of girls) while playing video games.[18]

32. **Unwanted sexual solicitation, grooming, and sextortion** occur through digital products such as social media and multiplayer video games. In a 2020 survey of teens 12-18 years old in the United Kingdom, 37% of girls and 20% of boys reported receiving sexual photos or videos online; authors reported these were often from adult strangers.[19] A nationally representative survey of U.S. young adults found that 22.5% of participants reported that they had been sexually solicited online as a child or teen, 10.3% had been threatened or coerced into sending sexual images, and 3.1% experienced revenge pornography.[20]

33. Grooming is a deceptive online behavior in which adults present themselves to a child as a potential friend or romantic partner. Sometimes minors do not realize that grooming behavior is of concern, because adult perpetrators appear friendly and flattering,[21] so the frequency of grooming is likely underreported. In a survey of U.S. college students, over 20% reported having online grooming interactions as minors. Of these, 28% met up with the adult in

[17] Anti-Defamation League. "Hate is no game: harassment and positive online experiences in online games in 2021" (New York: Anti-Defamation League, 2021). Available at: https://www.adl.org/resources/report/hate-no-game-harassment-and-positive-social-experiences-online-games-2021

[18] Gottfried, J. and Sidoti, O. (2024). Teens and Video Games Today. Pew Research Center. Available at: https://www.pewresearch.org/internet/2024/05/09/teens-and-video-games-today/#bullying-and-violence-in-video-games

[19] Ringrose, J., K. Regehr, and B. Mikne. 2021. Understanding and combatting youth experiences of image-based sexual harassment and abuse. ASCL. https://www.ascl.org.uk/ASCL/media/ASCL/Our%20view/Campaigns/Understanding-and-combatting-youthexperiences-of-image-based-sexual-harassment-and-abuse-full-report.pdf

[20] Finkelhor, D., H. Turner, and D. Colburn. 2022. Prevalence of online sexual offenses against children in the US. JAMA Network Open 5(10):e2234471–e2234471.

[21] National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27396.

person, and of these, 68% went on to have sex with the adult when they were still a minor.[22]

34. Sextortion, in which perpetrators threaten to release intimate images unless money, more images, or sex is provided, happened to 5% of middle and high school students in the U.S., according to a nationally representative study.[23] Three percent of U.S. students in this survey had perpetrated sextortion themselves. As noted in my original testimony, reports of sextortion to the National Center for Missing & Exploited Children more than doubled between 2019 and 2021,[24] likely due to the increased time children and teens spent online during the COVID-19 pandemic.

35. **Child sexual abuse material or child sexual exploitation material (CSAM/CSEM)** can be generated by adult perpetrators or by youth who seek to make money through selling sexually explicit images or videos of themselves. Children and teens who are victims of CSAM/CSEM experience a range of severe outcomes including negative self-perception, aggression, sexualized behavior, self-harming, post-traumatic symptoms, and educational problems.[25]

36. Self-generated CSEM increased by 77% in 2020 compared to the year before, driven by an increase among 11-13-year-old girls; in 2021 there was a three-fold increase among 7-10-year-olds.[26] Compared to "sexting," in which minors generate sexual imagery to share with romantic partners, self-generated CSEM refers to sexual photos, videos, or live streaming that a minor creates in response to coercion from another person in a position of power or through financial coercion.[27]

37. **Sales of illegal substances** such as methamphetamine, fentanyl, and other

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[22] Greene-Colozzi, E. A., Winters, G. M., Blasko, B., & Jeglic, E. L. (2020). Experiences and perceptions of online sexual solicitation and grooming of minors: A retrospective report. *Journal of child sexual abuse*, *29*(7), 836-854.

[23] Patchin, J. W., and S. Hinduja. 2020. Sextortion among adolescents: Results from a national survey of U.S. Youth. Sexual Abuse 32(1):30-54.

[24] National Center for Missing & Exploited Children, CyberTipline 2021 Report. https://www.missingkids.org/gethelpnow/cybertipline/cybertiplinedata

[25] Chauviré-Geib, K., & Fegert, J. M. (2024). Victims of technology-assisted child sexual abuse: A scoping review. *Trauma, Violence, & Abuse*, *25*(2), 1335-1348.

[26] Internet Watch Foundation Annual Report, 2022. Available at: https://www.iwf.org.uk/about-us/who-we-are/annual-report-2022/

[27] Bloxsom, G., McKibbin, G., Humphreys, C., Davidson, J., & Halfpenny, N. (2024). Five Forms of Coerced "Self-Produced" Child Sexual Exploitation Material: A Critical Interpretive Synthesis. *Trauma, Violence, & Abuse*, 15248380241271376.

psychoactive drugs regularly occur on social media platforms, according to the U.S. Drug Enforcement Administration (DEA).[28] DEA resources describe how social media drug sales often appear in advertisements that are in ephemeral stories or posts that are posted and removed within 24 hours. These posts include known code words and emojis that indicate elicit substances but are used to evade detection.[29] In a nationally representative survey of U.S. 15–25-year-olds, 2% reported purchasing drugs online (of substance-using respondents, 10% bought drugs online), of which 69% reported using social media.[30]

38. **Privacy invasions** can take the form of interpersonal privacy violations – for example, when a minor's location or activities are revealed through their activities on a digital platform – or data privacy invasions.

39. Interpersonal privacy violations occur due to features such as being tagged in a post without providing consent, automated geotagging, or real-time location-based display or features. Teens have developed a repertoire of defensive usage behaviors to try to control how much is displayed about them online.[31]

40. In comparison, research shows that teens are less aware of institutional or commercial data privacy and focus instead on interpersonal privacy online.[32] However, commercial data collection about minors' online activities is widespread. For example, recent enforcement action by the Department of Justice and Federal Trade Commission have shown that large digital platforms have collected and shared data on children and teens. In a complaint against TikTok, for instance, the U.S. Department of Justice reported that TikTok profiled teens by grade level for advertising purposes and retained data about minors including IP addresses,

[28] Drug Enforcement Administration National Drug Threat Assessment 2024. Available at: https://www.dea.gov/sites/default/files/2024-07/2024%20NDTA-updated%207.5.2024.pdf

[29] U.S. Drug Enforcement Administration (2022). "Social Media Drug Trafficking Threat." Available at: https://www.dea.gov/sites/default/files/2022-03/20220208-DEA_Social%20Media%20Drug%20Trafficking%20Threat%20Overview.pdf

[30] Oksanen, A., Miller, B. L., Savolainen, I., Sirola, A., Demant, J., Kaakinen, M., & Zych, I. (2021). Social media and access to drugs online: A nationwide study in the United States and Spain among adolescents and young adults. *The European Journal of Psychology Applied to Legal Context*, 13(1), 29-36.

[31] Chou, H. L., & Chou, C. (2023). How teens negotiate privacy on social media proactively and reactively. *New Media & Society*, *25*(6), 1290-1312.

[32] Stoilova, M., Nandagiri, R., & Livingstone, S. (2021). Children's understanding of personal data and privacy online–a systematic evidence mapping. *Information, Communication & Society*, *24*(4), 557-575.

device IDs, device models, and advertising IDs.[33] The U.S. Federal Trade Commission's recent Staff Report about social media and video streaming platforms,[34] summarizing information provided by companies in response to a regulatory request, described widespread practices of collecting data about users, such as demographic information, location, engagement with content/ads, and audiences – all with the purpose of targeting users with ads. Companies also make inferences about users such as relationship status, education level, household income, or "lifestyle details" that can lead to sensitive inferences about users (e.g., sexuality). The FTC reported that social media companies generally offered no controls over their use of data and treated teens the same as adult users.

41. Video game online platforms and mobile apps also collect data from players and use it to inform nudges to make purchases, for advertising, and to manipulate prices and availability of in-game items on a highly individualized level. As reviewed in a recent Consumer Financial Protection Bureau report, game companies track player behavior such as "purchasing history, spending thresholds, and how a player responds to personalized incentives like dynamic price updates. It also includes non-financial data, like how players interact with characters and the amount of time spent on tasks."[35] In addition to shaping prices and purchase pressure within the game, companies can also combine this data with device data (e.g., location, interactions with social media platforms) to generate a portrait of the player's identity for marketing purposes.

42. Even for children under age 13, when their data should be protected by the Children's Online Privacy Protection Act (COPPA), such data often is collected by mobile apps[36] and shared with marketers. Is has been estimated that ad tech companies collect an average of 72 million data points about a child before they turn 13.[37] Because online behaviors and mobile

[33] Complaint at 12, *United States v. Bytedance Ltd.*, No. CV 24-06525-OWD (RAO) (C.D. Cal. August 2, 2024). Available at: https://www.justice.gov/opa/media/1362606/dl?inline

[34] United States Federal Trade Commission. (2024). *A Look Behind the Screens: Examining the Data Practices of Social Media and Video Streaming Services.* Available at: https://www.ftc.gov/system/files/ftc_gov/pdf/Social-Media-6b-Report-9-11-2024.pdf

[35] Consumer Financial Protection Bureau. (2024). Banking in video games and virtual worlds. https://www.consumerfinance.gov/data-research/research-reports/issue-spotlight-video-games/

[36] Zhao, F., Egelman, S., Weeks, H. M., Kaciroti, N., Miller, A. L., & Radesky, J. S. (2020). Data collection practices of mobile applications played by preschool-aged children. *JAMA pediatrics*, *174*(12), e203345-e203345.

[37] Based on an analysis by SuperAwesome's ad exchange Rex. See:

(continued…)

gameplay patterns can reveal much about users' psychological characteristics, such data collection means that children are being profiled for the purposes of marketing before they can even understand their own emerging identities.

43. **Problematic, compulsive, addictive-like** use of digital media, video games, and social media is defined as use that impairs functioning, over which the user has no control, and which gets in the way of other daily activities and/or causes problems such as interpersonal conflict, poor grades, or health problems. Problematic internet use (i.e., internet use that gets in the way of daily functioning such as completing schoolwork, socializing, physical activity or sleep) has been estimated to occur in 4-6% of children 5-9 years old,[38] up to 19% of teens,[39] and 9-11% of a college-aged sample.[40]

44. In a nationally representative U.S. sample of 11-15-year-old girls, over one-third stated that they felt "addicted" to social media.[41] When validated rating scales are used, addictive-like social media use has been found in 5-7% of teens globally.[42]

45. Problematic, compulsive, addictive-like use of media is highly disruptive to child wellbeing and family functioning. In my clinical experience, these children and teens show significant difficulty stopping technology use or detaching from digital platforms and devices when asked. They frequently argue with their caregivers about time limits and consequences of excessive media use, such as poor sleep, missed homework, or refusal to take part in other activities.

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https://www.thedrum.com/news/2017/12/13/adtech-firms-collecting-vast-amounts-data-kids-despite-online-regulations

[38] Rega, V., Gioia, F., & Boursier, V. (2023). Problematic media use among children up to the age of 10: a systematic literature review. *International Journal of Environmental Research and Public Health*, *20*(10), 5854.

[39] Pontes, H. M., Kuss, D. J., & Griffiths, M. D. (2015). Clinical psychology of Internet addiction: a review of its conceptualization, prevalence, neuronal processes, and implications for treatment. *Neuroscience and Neuroeconomics*, 11-23.

[40] Moreno, M. A., Eickhoff, J., Zhao, Q., Young, H. N., & Cox, E. D. (2019). Problematic internet use: a longitudinal study evaluating prevalence and predictors. *The journal of pediatrics: X*, *1*, 100006.

[41] Nesi, J., Mann, S. and Robb, M. B. (2023). Teens and mental health: How girls really feel about social media. San Francisco, CA: Common Sense. Retrieved from https://www. commonsensemedia.org/sites/default/files/research/report/ how-girls-really-feel-about-social-media-researchreport_final_1.pdf

[42] Boer, M., Van Den Eijnden, R. J., Boniel-Nissim, M., Wong, S. L., Inchley, J. C., Badura, P., ... & Stevens, G. W. (2020). Adolescents' intense and problematic social media use and their well-being in 29 countries. *Journal of adolescent health*, *66*(6), S89-S99.

46. Problematic and addictive-like behaviors occur around video games as well. **Gaming disorder** is defined as loss of control over gaming, prioritizing gaming beyond other things important to the person's life, continuing to game despite negative consequences, and functional impairment such as job loss or relationship problems. Since 2019, it has been recognized by the World Health Organization's ICD diagnostic classification system, which means that it considered a diagnosable mental health disorder. Meta-analyses of gaming disorder suggest a prevalence among teens of 5-9%.[43]

47. Even among teens who do not meet criteria for problematic media use, 46% report being online "almost constantly," which has roughly doubled since 2014-2015, when rates were 24%.[44]

48. **Sleep disruption** or poor sleep quality is extremely common in the U.S. According to data from the Centers for Disease Control and Prevention from 2021, 35% of children under 14 years have insufficient sleep.[45] The prevalence of sleep disruption increases in the teen years: the same 2021 CDC data shows 77% of U.S. high schoolers do not sleep the recommended 8-10 hours overnight.[46] Eight to ten hours of sleep per night is crucial to child health to support neurological development, bone growth, and regulated endocrine system. Children and adolescents with insufficient sleep have a higher risk of obesity, diabetes, injuries, poor mental health, and attention problems.

49. A large body of observational evidence links longer digital media use to shorter sleep duration, later bedtimes, more overnight awakenings, and daytime sleepiness.[47] A key mechanism is thought to be mental stimulation from engaging with design features such as

[43] National Academies of Sciences, Engineering, and Medicine (2024). Social media and adolescent health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27396.

[44] Pew Research Center (2024). Teens and Internet, Device Access Fact Sheet. Available at: https://www.pewresearch.org/internet/fact-sheet/teens-and-internet-device-access-fact-sheet/

[45] Centers for Disease Control and Prevention: https://www.cdc.gov/sleep/data-research/facts-stats/children-sleep-facts-and-stats.html

[46] Centers for Disease Control and Prevention: https://www.cdc.gov/sleep/data-research/facts-stats/high-school-students-sleep-facts-and-stats.html

[47] Brautsch, L. A., Lund, L., Andersen, M. M., Jennum, P. J., Folker, A. P., & Andersen, S. (2023). Digital media use and sleep in late adolescence and young adulthood: A systematic review. *Sleep medicine reviews*, *68*, 101742.

message notifications.[48] [49]

50. In our study tracking 11-17-year-olds' smartphones, over half (59%) of participants used their phones overnight on school nights, some of which was initiated by notifications from digital platforms: we found that apps pushed between 1 to 12 notifications per hour to teens' phones between midnight and 5 am. The most used apps overnight on school nights (when teens should be resting to prepare for school the next day) were social media, mobile games, and YouTube.[50]

51. In this study, we interviewed teens to ask about their overnight technology use, and many discussed the negative spiral between technology use and poor sleep – for example, a 10th grader noted: "*I might say that for certain apps, like TikTok, it's really hard to fall asleep once you use it close to when you're gonna go to sleep. I can't use it within an hour, or else I'd struggle … and then I'll just get back on the app 'cause I'm not sleeping anyway.*"

52. Research shows that teens who already have poor sleep in particular have more disruption to sleep from social media.[51] A large-scale experiment in 12-19-year-olds found that reducing the use of screen media after 9 pm for 2 weeks improved teens' sleep onset, total sleep duration, and daytime attention.[52] These findings demonstrate a causal link between nighttime media use and poor sleep.

53. **Negative social comparison** of popularity, appearance, and happiness commonly occurs in youth using social media, and research suggests it may mediate associations between

[48] Alonzo, R., Hussain, J., Stranges, S., & Anderson, K. K. (2021). Interplay between social media use, sleep quality, and mental health in youth: A systematic review. *Sleep medicine reviews*, *56*, 101414.

[49] Scott, H., Biello, S. M., & Woods, H. C. (2019). Identifying drivers for bedtime social media use despite sleep costs: The adolescent perspective. *Sleep Health, 5 (6), 539-545*.

[50] Radesky, J., Weeks, H.M., Schaller, A., Robb, M., Mann, S., and Lenhart, A. (2023). Constant Companion: A Week in the Life of a Young Person's Smartphone Use. San Francisco, CA: Common Sense. Available at: https://www.commonsensemedia.org/sites/default/files/research/report/2023-cs-smartphone-research-report_final-for-web.pdf

[51] Shimoga, S. V., Erlyana, E., & Rebello, V. (2019). Associations of social media use with physical activity and sleep adequacy among adolescents: Cross-sectional survey. *Journal of medical Internet research*, *21*(6), e14290.

[52] Perrault, A. A., Bayer, L., Peuvrier, M., Afyouni, A., Ghisletta, P., Brockmann, C., ... & Sterpenich, V. (2019). Reducing the use of screen electronic devices in the evening is associated with improved sleep and daytime vigilance in adolescents. *Sleep*, *42*(9), zsz125.

social media use and negative affect[53] or depression symptoms.[54] Some teens are more susceptible to negative social comparison after browsing social media, and are also most helped by interventions to reduce this phenomenon.[55] Negative social comparison is relatively common in teens using social media; in surveys collected as part of internal research at Meta, released by a whistleblower and compiled by the Harvard Kennedy School Shorenstein Center on Media, Politics and Public Policy, at least 20% of teens experienced negative social comparison on Instagram "often" or "very often."[56]

54. **Financial harms.** Consumer spending on video game content has steadily increased for the past 15 years, estimated at $48 billion in 2023;[57] in-game purchases make up the majority of this revenue for many video game companies.[58] Estimates from global regulators suggest that about one-third of children and teens aged 8–17 years have made in-game purchases in the previous 12 months; in the U.S., 85% of 'core gamers' (teens and young adults who play at least 7 hours per week) make in-game purchases.[59]

55. In-game spending can become excessive: in a recent advisory, the Consumer Financial Protection Bureau reported that "parents have reported an overwhelming amount of unexpected gaming transactions on their credit or debit card statements in consumer complaints to the Federal Trade Commission and Consumer Financial Protection Bureau."[60] A multitude of such cases have been covered by news media, including a recent story about a minor charging

[53] Nesi, J., & Prinstein, M. J. (2015). Using social media for social comparison and feedback-seeking: Gender and popularity moderate associations with depressive symptoms. *Journal of abnormal child psychology*, *43*, 1427-1438.

[54] Cataldo, I., Lepri, B., Neoh, M. J. Y., & Esposito, G. (2021). Social media usage and development of psychiatric disorders in childhood and adolescence: a review. *Frontiers in Psychiatry*, *11*, 508595.

[55] Weinstein, E. (2017). Adolescents' differential responses to social media browsing: Exploring causes and consequences for intervention. *Computers in Human Behavior*, *76*, 396-405.

[56] Harvard Kennedy School Shorenstein Center on Media, Politics and Public Policy. (2023). *Discussion Paper: Case Study on Youth Online Harms – Project Daisy*, Appendix A (p.13). Available at: https://shorensteincenter.org/wp-content/uploads/2023/11/Discussion-Paper_Youth-Online-Harms-and-Project-Daisy_For-Shorenstein-Publication.pdf

[57] https://www.statista.com/statistics/252457/consumer-spending-on-video-games-in-the-us/

[58] https://www.statista.com/statistics/1208560/activision-blizzards-revenue-by-composition/

[59] https://www.ipsos.com/en-us/younger-gamers-display-strong-and-diverse-spending-behavior-across-video-game-touchpoints

[60] Consumer Advisory: Video games are targeting your children to get into your wallet (2024). Consumer Financial Protection Bureau. Available at: https://www.consumerfinance.gov/about-us/newsroom/consumer-advisory-video-games-are-targeting-your-children-to-get-into-your-wallet/

$4000 in in-game purchases on his parents' credit card.[61] Teens with problematic media use and gaming disorder are more likely to engage in excessive and impulsive in-game spending, particularly on purchases with gambling-like elements like lootboxes.[62]

WHY MINORS ARE VULNERABLE ONLINE

56. In my initial declaration, I described how children and teens differ from adults in several developmental domains. To briefly summarize here, children and teens have underdeveloped executive functions, meaning they have less impulse control, perspective taking, or critical thinking about digital media. They are more susceptible to rewards, both concrete/token-type rewards (e.g., likes, coins, in-game items, skins, etc.) as well as social rewards from peers or parasocial relationships. In this declaration, I add additional detail to lay the context for why children and teens are more vulnerable to specific digital design features than adults.

57. During the late school-age (8-10 years) and adolescent years (11-17 years), minors start showing more risk-taking and exploration behaviors. This helps them individuate from their parents and come to a sense of their own identity. Some teens are more prone to risky behaviors because of sensation-seeking or pleasure-seeking personalities. Because of the general sense of invulnerability teens experience, they often do not pay attention to the risks or future consequences of their immediate behavior[63] – such as spending money or sending a sexually intimate image.

58. Children's and teens' behavior is more reinforced by immediate gratification from rewards or high-pleasure experiences, which can lead to unhealthy habit formation.[64]

59. During adolescence, peer feedback is incredibly important. Social feedback shapes

[61] https://abcnews.go.com/GMA/Family/parents-share-warning-after-son-spends-4000-playing/story?id=108845824

[62] Hing, N., Russell, A. M., King, D. L., Rockloff, M., Browne, M., Newall, P., & Greer, N. (2023). Not all games are created equal: Adolescents who play and spend money on simulated gambling games show greater risk for gaming disorder. *Addictive Behaviors*, *137*, 107525.

[63] National Academies of Sciences, Engineering, and Medicine (2024). Social media and adolescent health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27396.

[64] De Decker, Annelies, et al. "Associations of reward sensitivity with food consumption, activity pattern, and BMI in children." *Appetite* 100 (2016): 189-196.

identity through the act of trying out new appearances, thoughts, behaviors, or interests; expressing them to others; and adapting based on reactions from others. Adolescents are therefore particularly susceptible to public bullying and harassment because they are more likely to "put themselves out there" and be highly sensitive to what others say.

60. Teens tend to perceive themselves as the center of others' attention[65] and therefore are highly conscious of online feedback, social rewards, or sexual attention. Therefore, they may accept or seek out connections with contacts they don't know in person, based on similar interests or social networks.

61. Children and teens may also over-focus on popularity metrics such as likes and follower counts as an indicator of their self-worth.[66] This is due to their sensitivity to social status as described above, and because of relatively more concrete thinking about quantifiable popularity counts.

ONLINE HARMS OCCUR DUE TO DESIGN FEATURES THAT FAIL TO PROTECT MINORS' PRIVACY

A. Interpersonal Privacy

62. Digital product designs such as public accounts, recommendations to connect with strangers, anonymity, and monetization contribute to contact and conduct harms like CSAM/CSEM, bullying/harassment, and privacy violations.

63. **CSAM/CSEM:** Children and teens may be motivated to make their account public or use 'friends of friends' features to add more contacts in order to increase their friend or follower count, a metric of their popularity. Children at this age have a drive for affirmation and validation, but may not be aware of the motives of their followers. In OfCom's recent in-depth examination of hazards that led to online harms in a group of 42 children aged 7-17 years, youth

[65] National Academies of Sciences, Engineering, and Medicine (2024). Social media and adolescent health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27396.

[66] American Psychological Association. (2024). Potential risks of content, features, and functions: The science of how social media affects youth. Available at: https://www.apa.org/topics/social-media-internet/youth-social-media-2024

reported regularly using these 'friend finding' network-expanding features.[67] Several children reported that they didn't know the people recommended to them with this feature, but nonetheless used it to appear to have a stronger social 'status.' This leads to child users being added to group chats, in which youth are subject to racial slurs or have been sent links for pornography, scams, or discussions about drugs.

64. Youth in this study also reported that, in order to get more engagement and validation for their posts through likes and followers, they posted more risky, shocking or attention-grabbing posts, which puts them at further risk of grooming.[68]

65. Predators may search out youth profiles who have low follower or like counts, who may be more desperate to connect to achieve more validation. Signals of when youth accounts are online or their geolocation may contribute to stalking behavior from predators.

66. In an in-depth investigation from the Stanford Internet Observatory,[69] many underage sellers (ages 13-17 years) of self-generated CSEM were identified on Instagram and X/Twitter. Researchers found that "recommendation algorithms inadvertently boost the network [of buyers/underage sellers]; a user who follows one seller account received related suggestions for others." They concluded "Due to widespread use of hashtags, relatively long life of seller accounts, and, especially, the effective recommendation algorithm, Instagram serves as the key discovery mechanism for this specific community of buyers and sellers." Self-generated CSEM sellers also rely heavily on ephemeral media such as Stories with content menus, promotions, or cross-site links to advertise access to their intimate images.

67. In this way, **profiling of minors based on their prior activity or contacts** can lead to CSAM/CSEM harms through automated recommendation of contacts who share their interest in CSAM/CSEM, or recommendation of youth accounts to perpetrators.[70] **This risk is**

[67] OfCom. (2022) Research into risk factors that may lead children to harm online. Available at: https://www.ofcom.org.uk/siteassets/resources/documents/research-and-data/online-research/keeping-children-safe-online/risk-factors-that-may-put-children-at-harm-online/children-risk-factors-report.pdf?v=328565

[68] Ibid.

[69] Thiel, D., DiResta, R., Stamos, A. (2023). *Cross-platform dynamics of self-generated CSAM.* Stanford Internet Observatory. Available at: https://cyber.fsi.stanford.edu/io/publication/cross-platform-dynamics-self-generated-csam

[70] Bleakley, P., E. Martellozzo, R. Spence, and J. DeMarco. 2023. Moderating online child sexual abuse

(continued…)

compounded by social quantification metrics such as visible like and follower counts.

68. **Cyberbullying and harassment** are facilitated by anonymity,[71] a design feature that removes accountability. It can also be reinforced through likes and social quantification metrics in response to harassing posts.

69. **Sale of illegal substances:** In a 2019 report in which avatar teen accounts were created based on real teens' interests, their accounts were discovered by accounts selling illegal substances and pornography, who directly messaged them with solicitations.[72]

B. Commercial Privacy: Harms from Profiling

70. When commercial profiles are created about minors based on the data described in sections 40-42, it allows companies to infer preferences and lifestyle characteristics that can be targeted with advertising. In this section, I review examples of how profiling can lead to targeted advertising for harmful or illegal activities for teens (e.g., gambling, alcohol) and manipulative tactics intended to encourage more in-game spending.

71. **Gambling** is now available online in many U.S. states through casino and sports betting apps. The World Health Organization-UNICEF-Lancet Commission has urged that "*new technologies are exacerbating and creating new threats to children that are not well understood. Gambling is a potentially large and unaddressed public health challenge for children*."[73]

72. Most gambling advertising research has been performed in the United Kingdom or Australia, where online gambling and sports betting have been legal for a longer time than in the U.S. These studies show that exposure to gambling ads is common, particularly for youth who follow related accounts. For example, the UK Gambling Commission reported that 37% of 11–16-year-olds reported seeing gambling ads on social media,[74] while another study found that

material (CSAM): Does self-regulation work, or is greater state regulation needed? European Journal of Criminology. https://doi.org/10.1177/14773708231181361

[71] National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27396.

[72] 5Rights Foundation. (2021). *Pathways: How digital design puts children at risk.* Available at: https://5rightsfoundation.com/uploads/Pathways-how-digital-design-puts-children-at-risk.pdf

[73] Clark, H., Coll-Seck, A. M., Banerjee, A., Peterson, S., Dalglish, S. L., Ameratunga, S., ... & Costello, A. (2020). A future for the world's children? A WHO–UNICEF–Lancet Commission. *The Lancet*, *395*(10224), 605-658.

[74] Gambling Commission. Young people and gambling 2020. (2020). Available at: https://www.gamblingcommission.gov.uk/statistics-and-research/publication/young-people-and-gambling-2020#files

45.7% of 11–17-year-olds endorsed seeing gambling ads on social media at least once per week.[75] An analysis of over 840,000 gambling ads on Twitter found that large numbers of children (41,000 under age 16) follow gambling accounts. These ads and accounts often include enticements such as celebrity endorsements, free bets, and memes that are highly appealing to teens.[76] This appeal may be because gambling advertisers make heavy use of 'insider sentiments' — 'in jokes' or niche expert information – that elicits the feeling of belonging to a special club,[77] which is a particularly strong psychological pull for adolescents.[78]

73. The reasons for minors seeing such a high volume of gambling ads online may include: 1) teens may not be honest about their age, so the online service thinks they are of a legal age to gamble; 2) teens are being intentionally targeted with gambling ads on social media (which is supported by recent work from the Australia Gambling Commission);[79] and/or 3) their online behaviors – such as following sports betting or football/soccer accounts – lump them together with similar profiles who are interested in gambling.[80] In conditions #2 and #3, profiling is facilitating the introduction of a minor to an activity that is illegal for them. This is important, since exposure to gambling promotions and ads has been associated with gambling interest and behaviors in teens.[81]

74. **Alcohol** advertising exposure is associated with higher intent to try alcohol and drinking behaviors in teens.[82] In an innovative 2024 study in which the phones of 16 children,

[75] Rossi R, Nairn A. What are the odds? The appeal of gambling adverts to children and young persons on Twitter [Internet]. University of Bristol. 2021. Available from: https://www.bristol.ac.uk/media-library/sites/management/documents/what-are-the-odds-rossi-nairn-2021.pdf.

[76] *Ibid.*

[77] Smith J, Nairn A. (2019). Biddable youth - sport and esport gambling advertising on Twitter: appeal to children, young & vulnerable people. Available at: https://demos.co.uk/wp-content/uploads/2019/08/Biddable-youth-report.pdf

[78] Rossi, R., & Nairn, A. (2022). New developments in gambling marketing: the rise of social media ads and its effect on youth. *Current Addiction Reports*, *9*(4), 385-391.

[79] VicHealth. "Dark marketing tactics of harmful industries exposed by young citizen scientists." (2023): https://www.vichealth.vic.gov.au/media-and-resources/citizen-voices-against-harmful-marketing

[80] Gainsbury, S. M., King, D. L., Russell, A. M., Delfabbro, P., Derevensky, J., & Hing, N. (2016). Exposure to and engagement with gambling marketing in social media: Reported impacts on moderate-risk and problem gamblers. *Psychology of Addictive Behaviors*, *30*(2), 270.

[81] Noble, N., Freund, M., Hill, D., White, V., Leigh, L., Lambkin, D., ... & Sanson-Fisher, R. (2022). Exposure to gambling promotions and gambling behaviours in Australian secondary school students. *Addictive Behaviors Reports*, *16*, 100439.

[82] Finan, L. J., Lipperman-Kreda, S., Grube, J. W., Balassone, A., & Kaner, E. (2020). Alcohol marketing

(continued…)

teens, and young adults were followed with software that recorded and analyzed every social media ad they saw, teens (14 to 17 years of age) saw an average of one gambling ad, 6 alcohol ads, and 24 junk food ads per day.[83]

75. Thus, it is clear that minors see advertisements on social media for products that are not legal at their age. The targeting mechanisms underlying these ads are not transparent to researchers. However, in a 2021 study conducted by Reset Australia, researchers purchased ads on Facebook, who at the time allowed targeting to teens who had been profiled as having age-inappropriate, harmful or risky interests, including smoking and vaping, alcohol, gambling, products rated 18+, such as Playboy, and online dating services.[84] **This suggests that online services and social media have the ability and the business interest in creating marketing profiles of minors but have not provided sufficient oversight to ensure that such targeting is age-appropriate.**

76. **In-game spending pressure:** Profiling of minors occurs in online and mobile games as well. In an analysis of patents submitted by video game companies, almost all used sophisticated systems involving collection and analysis of player data to optimize the type and scheduling of purchasing offers to increase the probability of purchase.[85] Player data (e.g., purchasing tendencies, available funds, item preferences, inventory) was used to shape sales tactics such as: 1) solicitations (purchasing offers, sometimes interrupting play, often with pressure tactics) and 2) non-disclosure of the fact that the player's data determines what prices, goods, or probabilities are offered to them.

77. In simpler terms, this means that an online or mobile game gets to "know" a player's gaming patterns and can manipulate that player to spend more money or time on the

and adolescent and young adult alcohol use behaviors: A systematic review of cross-sectional studies. *Journal of Studies on Alcohol and Drugs, Supplement*, (s19), 42-56.

[83] Backholer, K,. Pathirana, N.L. (2024). #DigitalYouth: How children and young people are targeted with harmful product marketing online. Deakin University. Available at: https://iht.deakin.edu.au/wp-content/uploads/sites/153/2024/06/Digital-Youth-brief-Final-2.pdf

[84] Williams, D., McIntosh, A., Farthing, R. (2021). "Profiling children for advertising: Facebook's monetization of young people's personal data." Reset Australia Policy Memo. https://au.reset.tech/uploads/resettechaustralia_profiling-children-for-advertising-1.pdf

[85] King, D. L., Delfabbro, P. H., Gainsbury, S. M., Dreier, M., Greer, N., & Billieux, J. (2019). Unfair play? Video games as exploitative monetized services: An examination of game patents from a consumer protection perspective. *Computers in Human Behavior*, *101*, 131-143.

game. For example, if a teen tends to make more purchases at certain times of day, at frustrating gameplay points (e.g., running out of 'lives'), or in response to certain types of marketing messages, then the teen will receive more pop-ups, offers, or nudges that are harder for them to resist. Yet, the teen may believe that all players of that game receive the same types of offers and prices. In teens with impulse control problems or gaming disorder, such manipulation may generate financial harms as the game system gets to know the player's purchase patterns and vulnerabilities over time.[86]

ONLINE HARMS OCCUR DUE TO DESIGN FEATURES THAT EXTEND MINORS' TIME ON DIGITAL PRODUCTS AND FOSTER COMPULSIVE USE

78. **Minors spend more time online than they intend, feel pressure to engage, and find it hard to stop using platforms**.[87] This leads to problems for children and teens such as not getting a good night's sleep and displacement of other activities like physical activity or in-person activities with family or friends. Youth point to design features like infinite scroll, autoplay, and push notifications as mechanisms that extend their use, make them feel compelled to return to media and displace other things they meant to do.[88] Nearly three-quarters of teenagers believe that technology companies manipulate users to spend more time on their products.[89]

79. **Research backs up these teen perceptions: studies show that more time online is associated with lower child and teen wellbeing** such as poorer sleep,[90, 91] more sedentary

[86] Dreier, M., Wölfling, K., Duven, E., Giralt, S., Beutel, M. E., & Müller, K. W. (2017). Free-to-play: About addicted Whales, at risk Dolphins and healthy Minnows. Monetarization design and Internet Gaming Disorder. *Addictive behaviors*, *64*, 328-333.

[87] Weinstein, Emily, and Carrie James. *Behind their screens: What teens are facing (and adults are missing)*. MIT Press, 2022.

[88] OfCom. (2022). *Research into risk factors that may lead children to harm online.* Available at: https://www.ofcom.org.uk/siteassets/resources/documents/research-and-data/online-research/keeping-children-safe-online/risk-factors-that-may-put-children-at-harm-online/children-risk-factors-report.pdf?v=328565

[89] Rideout, V., & Robb, M. B. (2018). Social media, social life: Teens reveal their experiences. San Francisco, CA: Common Sense Media. Retrieved from https://www.commonsensemedia.org/sites/default/files/research/report/2018-social-mediasocial-life-executive-summary-web.pdf

[90] Janssen, Xanne, et al. "Associations of screen time, sedentary time and physical activity with sleep in under 5s: A systematic review and meta-analysis." *Sleep medicine reviews* 49 (2020): 101226.

[91] Carter, Ben, et al. "Association between portable screen-based media device access or use and sleep outcomes: a systematic review and meta-analysis." *JAMA pediatrics* 170.12 (2016): 1202-1208.

behaviors,[92] more parent-child relationship difficulties,[93] and more behavior problems.[94]

80. **Design features play a role in extending users' time online and re-engaging them repeatedly with digital products.** Although engagement-promoting designs can make digital products more fun and satisfying to use, when they are used to excess to extend minors' time online, there is more potential for harm.[95] Moreover, the use of too many engagement-promoting designs in digital products makes teens frustrated and reduces their sense of control and autonomy.[96]

81. Higher user engagement with digital products is a business goal of companies that generate revenue through advertising. In fact, companies such as Meta and Google report metrics such as 'daily active users' and advertising sales in their quarterly earnings reports to shareholders. Therefore, design teams are instructed to maximize engagement metrics such as time spent and how often users open the app.[97] The effectiveness of different designs at reaching these goals are tested through A/B testing (a process in which two versions of a design are released to different users at random; the more engaging or higher-performing design is retained).

82. In this section, I will describe the digital product design features that contribute to extended use, feelings of compulsion to return to the product frequently, and/or difficulties disengaging when the user intends. This list of design features is informed by the Biden-Harris Interagency Task Force on Kids Online Health and Safety report,[98] extensive academic research that explores how young people interact with digital design, and published experiments that alter

[92] Wang, Xiao, Yuexuan Li, and Haoliang Fan. "The associations between screen time-based sedentary behavior and depression: a systematic review and meta-analysis." *BMC public health* 19 (2019): 1-9.

[93] Sampasa-Kanyinga, H., Goldfield, G. S., Kingsbury, M., Clayborne, Z., & Colman, I. (2020). Social media use and parent–child relationship: A cross-sectional study of adolescents. *Journal of Community Psychology*, *48*(3), 793-803.

[94] Eirich, Rachel, et al. "Association of screen time with internalizing and externalizing behavior problems in children 12 years or younger: a systematic review and meta-analysis." *JAMA psychiatry* (2022).

[95] Montag, C., & Elhai, J. D. (2023). On Social Media Design,(Online-) Time well-spent and addictive behaviors in the age of surveillance capitalism. *Current Addiction Reports*, *10*(3), 610-616.

[96] 5 Rights Foundation. (2023). Disrupted Childhood: The cost of persuasive design. Available at: https://5rightsfoundation.com/resource/updated-report-disrupted-childhood-the-cost-of-persuasive-design/

[97] Lubin, N. and Iyer, R. (2023). How tech regulation can leverage product experimentation results. Lawfare. Available at: https://www.lawfaremedia.org/article/how-tech-regulation-can-leverage-product-experimentation-results

[98] Online Health and Safety for Children and Youth: Best Practices for Families and Guidance for Industry. Kids Online Health and Safety Task Force (2024). https://www.samhsa.gov/sites/default/files/online-health-safety-children-youth-report.pdf

digital design and test effects on user wellbeing.

83. It is important to note that companies that operate digital products hold vast amounts of experimental data about the effectiveness of the below design features in prolonging usage sessions or keeping users coming back. Other than the internal research revealed in the files from Facebook whistleblower Frances Haugen, these experimental results are not currently available to the public.

Evidence of design features prolonging time online or encouraging repeated engagement

84. **Designs that elicit Fear of Missing Out (FoMO)** are common on social platforms. FoMO is defined as "pervasive apprehension that others might be having rewarding experiences from which one is absent and is characterised by the desire to stay continually connected with what others are doing."[99] Researchers have interviewed teens and young adults about design features that contribute to FoMO, which include:[100]

a. Tagging that leads to a fear of missing the ability to interact through social reciprocity with someone who tagged them
b. Ephemeral content that leads to a fear of missing information
c. Recommendations to build networks that lead to fears of not having a big enough friend group and tap into the need for belonging and popularity
d. Social traces that show when others are online, such as indicators that someone is active on a platform but is not reacting to the user's posts or messages, that lead to fears of missing important interactions
e. Impression and like counts that trigger pressure to increase popularity or be interesting to other people
f. Notifications that can trigger a fear of missing important

[99] Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, emotional, and behavioral correlates of fear of missing out. *Computers in human behavior*, *29*(4), 1841-1848.

[100] Alutaybi, A., Arden-Close, E., McAlaney, J., Stefanidis, A., Phalp, K., & Ali, R. (2019, October). How can social networks design trigger fear of missing out?. In *2019 IEEE International Conference on Systems, Man and Cybernetics (SMC)* (pp. 3758-3765). IEEE.

information

85. Users who experience more FoMO have higher rates of problematic social media use and addiction-like behaviors.[101]

86. **Ephemeral designs** are time-limited features on social media that present content for only a brief time, for example a 24-hour period. Such ephemeral designs essentially ensure that users log in to platforms on a daily basis, so that they do not miss anything posted by friends or accounts they follow. Research shows that people are motivated to engage with ephemeral content out of fear of missing out and social pressure; however, ephemeral content is not always gratifying to users, especially when they feel pressure or obligated to engage with it.[102] For this reason, The Kids Online Health and Safety Task Force recommended that young users have the option to extend the availability of time-limited content.[103]

87. **Notifications** from digital products alert the user to new communication, content, or other new activity on the platform via audio, visual, and/or physical (e.g., vibration) stimuli. Notifications cause an involuntary orienting response, bringing the user's attention to a digital product and causing delayed responses to whatever else the user is doing. Multiple studies in college classrooms have demonstrated that phone notifications cause higher error rates and lower recall of taught material.[104] In experiments, teens show particularly more distractibility and physiologic changes in response to phone notifications, compared to adults.[105]

88. In our study tracking the smartphones of over 200 11-17-year-olds,[106] we

[101] Elhai, J. D., Yang, H., & Montag, C. (2020). Fear of missing out (FOMO): overview, theoretical underpinnings, and literature review on relations with severity of negative affectivity and problematic technology use. *Brazilian Journal of Psychiatry*, *43*(2), 203-209.

[102] Chen, K. J., & Cheung, H. L. (2019). Unlocking the power of ephemeral content: The roles of motivations, gratification, need for closure, and engagement. *Computers in Human Behavior*, *97*, 67-74.

[103] Online Health and Safety for Children and Youth: Best Practices for Families and Guidance for Industry. Kids Online Health and Safety Task Force (2024). https://www.samhsa.gov/sites/default/files/online-health-safety-children-youth-report.pdf

[104] Rosen, L. D. (2017). The distracted student mind—enhancing its focus and attention. *Phi Delta Kappan*, *99*(2), 8-14.

[105] Whiting, W. L., & Murdock, K. K. (2021). Notification alert! Effects of auditory text alerts on attention and heart rate variability across three developmental periods. *Quarterly Journal of Experimental Psychology*, *74*(11), 1900-1913.

[106] Radesky, J., Weeks, H.M., Schaller, A., Robb, M., Mann, S., and Lenhart, A. (2023). Constant Companion: A Week in the Life of a Young Person's Smartphone Use. San Francisco, CA: Common Sense. Available at: https://www.commonsensemedia.org/sites/default/files/research/report/2023-cs-smartphone-research-report_final-for-web.pdf

measured the frequency and timing of notifications from different apps. On a typical day, participants received a median of 237 notifications, with a maximum of 4500 per day in one participant. About a quarter (23%) of notifications arrived during school hours, and about 5% during school night hours, two times of day that are more disruptive to wellbeing. Very few participants received no notifications at all during school hours or school night hours. Snapchat and Discord ranked highest in the number of notifications sent to participants in a typical day, with some participants receiving hundreds of messages from these platforms.

89. Teens interviewed for this study did not find notifications to necessarily be a positive thing, and they exerted energy to manage and mute notifications. Some teens recognized how platforms tried to get their attention through adding new types of irrelevant notifications: One 11th grader made the following observation: *"Another thing with notifications, one thing I've noticed with Instagram is, over time, they keep adding new, different types of notifications. Like when they rolled out reels, they had a notification like, 'Check out the most watched reels for today.' So over time, you have to keep turning off those specific notifications because I still wanna receive messages from my friends through DMs. I don't wanna receive those kind of unimportant messages."*

90. **Social quantification and quantified approval** such as likes, hearts, friend numbers, scores, and streaks have been linked with negative social comparison in Meta's internal research and independent studies.[107] In Project Daisy, an internal Meta experiment in which Instagram users were randomly assigned to visible or hidden Like counts, there was a reported 2% reduction in negative social comparison in the users with hidden Like counts. Teen users reported that hiding Like counts made them less likely to care about likes or compare the number of Likes they received with others.[108]

91. Socially anxious teens report that quantifying relationships increases their anxiety:

[107] Wallace, E., & Buil, I. (2021). Hiding Instagram Likes: Effects on negative affect and loneliness. *Personality and Individual Differences*, *170*, 110509.

[108] Harvard Kennedy School Shorenstein Center on Media, Politics and Public Policy. (2023). *Discussion Paper: Case Study on Youth Online Harms – Project Daisy*, Appendix A (p.15-16). Available at: https://shorensteincenter.org/wp-content/uploads/2023/11/Discussion-Paper_Youth-Online-Harms-and-Project-Daisy_For-Shorenstein-Publication.pdf

"It becomes almost stressful to post anything, because the amount of likes you get is your social standing. Your popularity or how much you're liked is based upon numbers on a screen" reported a 16-year-old interviewed by 5 Rights Foundation.[109] Rather than focusing on the quality of burgeoning relationships in the teen years, an essential step in identity development, many teens over-focus on quantity of approval from online contacts, many of whom they may not know. As one 13-year-old stated: "*[There is] pressure of losing your friends and endling lifelong friendships if you forget to send a streak one day."*

92. **Low-friction infinite scroll** has been found to keep users on digital products longer, in part because it induces *normative dissociation,* a mental "flow" state in which people feel "spaced out" and have reduced self-awareness or memory.[110] Many people use digital products to seek out normative dissociation as an escape from stress (e.g., by reading or listening to music), but in studies about digital products, an extended time spent in such dissociation leads to regret and self-blame that has been called the "30-minute Ick Factor"[111] – meaning that after about 30 minutes, users feel that their scrolling is less meaningful and they are less in control of disengaging. This aligns with internal TikTok documents suggesting that approximate 35 minutes of scrolling is needed before users have trouble disengaging, as reported by National Public Radio after reviewing the unredacted Kentucky Attorney General's October 2024 complaint against TikTok.[112]

93. In experiments that added slight friction to infinite scroll feeds, using designs that helped users reflect on what they had read and be self-aware of how much time they spent, users were able to disengage more easily and remember more of what they had consumed on Twitter.[113]

[109] 5 Rights Foundation. (2023). Disrupted Childhood: The cost of persuasive design. Available at: https://5rightsfoundation.com/resource/updated-report-disrupted-childhood-the-cost-of-persuasive-design/

[110] Baughan, A., Zhang, M. R., Rao, R., Lukoff, K., Schaadhardt, A., Butler, L. D., & Hiniker, A. (2022, April). "I Don't Even Remember What I Read": How Design Influences Dissociation on Social Media. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (pp. 1-13).

[111] Tran, J. A., Yang, K. S., Davis, K., & Hiniker, A. (2019, May). Modeling the engagement-disengagement cycle of compulsive phone use. In *Proceedings of the 2019 CHI conference on human factors in computing systems* (pp. 1-14).

[112] National Public Radio, Oct 11 2024: TikTok executives know about app's effect on teens, lawsuit documents allege. Available at: https://www.npr.org/2024/10/11/g-s1-27676/tiktok-redacted-documents-in-teen-safety-lawsuit-revealed

[113] Zhang, M. R., Lukoff, K., Rao, R., Baughan, A., & Hiniker, A. (2022, April). Monitoring screen time or

(continued…)

94. In fact, experiments that reduce engagement-prolonging features (e.g., scrolling on a feed) are more effective at reducing smartphone overuse, compared to experiments that lock out users or impose time-based alarms.[114] In one innovative experiment, 71 users trained their phones to recognize their unique patterns of overuse, and by adding a brief friction design (e.g., typing in a code to continue scrolling) timed precisely for their usual point of regretting overuse, they were able to cut time on their smartphone by 8-9% over 8 weeks.[115]

95. A different experiment used software that slowed or delayed the reaction of the phone to the input action used while navigating endless feeds, such as swiping, on particular apps the participant chose. These apps included Instagram, YouTube, Reddit, Discord and Twitter/X. This additional scroll friction led to a 16% decrease in time spent on the target apps and a high acceptability from users.[116]

96. Thus, there is causal evidence that, when infinite scroll features are reduced, this causes users to spend less time on digital platforms – most importantly, less time that they perceive as not meaningful.

97. **Autoplay** is a design in which videos automatically play when the prior video ends, or the user scrolls and hovers over the video. Research on autoplay suggests that it reduces users' sense of agency because it distracts them from searching or finding the video they initially intended.[117] It also contributes to more mindless viewing.[118] In interview studies, parents report that autoplay contributes to conflict with their children when they try to get their child to stop

redesigning it? Two approaches to supporting intentional social media use. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (pp. 1-19).

[114] Adiba Orzikulova, Hyunsung Cho, Hye-Young Chung, Hwajung Hong, Uichin Lee, and Sung-Ju Lee. 2023. FinerMe: Examining App-level and Feature-level Interventions to Regulate Mobile Social Media Use. Proc. ACM Hum.-Comput. Interact. 7, CSCW2, Article 274 (oct 2023). https://doi.org/10.1145/3610065

[115] Orzikulova, A., Xiao, H., Li, Z., Yan, Y., Wang, Y., Shi, Y., ... & Xu, X. (2024, May). Time2Stop: Adaptive and Explainable Human-AI Loop for Smartphone Overuse Intervention. In *Proceedings of the CHI Conference on Human Factors in Computing Systems* (pp. 1-20).

[116] Lu, T., Zheng, H., Zhang, T., Xu, X. O., & Guo, A. (2024, May). InteractOut: Leveraging Interaction Proxies as Input Manipulation Strategies for Reducing Smartphone Overuse. In *Proceedings of the CHI Conference on Human Factors in Computing Systems* (pp. 1-19).

[117] Lukoff, K., Lyngs, U., Zade, H., Liao, J. V., Choi, J., Fan, K., ... & Hiniker, A. (2021, May). How the design of youtube influences user sense of agency. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-17).

[118] Chaudhary, A., Saroha, J., Monteiro, K., Forbes, A. G., & Parnami, A. (2022, June). "Are you still watching?": exploring unintended user behaviors and dark patterns on video streaming platforms. In *Proceedings of the 2022 ACM Designing Interactive Systems Conference* (pp. 776-791).

using media.[119] In an experimental study, children showed more negative behavior when asked to transition away from an app with autoplay compared to apps without autoplay or a print book.[120]

98. **Manipulative Gamification.** Gamification occurs through motivational designs like points, leaderboards, earned badges, levels, and rewards. Gamification is known to leverage user psychology to shape behavior. A meta-analysis of experiments testing the impact of gamification features on user behavior found such features had broad effectiveness in keeping users engaged.[121],[122] While gamification is often perceived as entertaining to users, it can also be used in ways that contribute to problematic media use, for example when badges are provided for returning to a game on a strict daily basis or rewards are provided after prolonged periods of usage.

99. **In mobile games,** such engagement-prolonging designs are common. In our review of manipulative designs in mobile apps, we found designs such as daily rewards (e.g., free virtual currency or in-game items) for returning to the app daily, time pressure to return at specific times of day to collect rewards, and notifications sent from characters urging the player to come back to the app.[123] In that study, many mobile games didn't give players the option to save their progress and quit, which contributes to urgency to continue playing. Other research has described pressure for teens to "play by appointment" – a manipulative design in which the mobile game dictates when the player should return for rewards, without regard for whether the player is in school or has other obligations at that time.[124]

100. Mobile games also offer gambling-like designs such as loot boxes (in which a

[119] Hiniker, Alexis, et al. "Screen time tantrums: How families manage screen media experiences for toddlers and preschoolers." *Proceedings of the 2016 CHI conference on human factors in computing systems*. 2016.

[120] Munzer, Tiffany G., et al. "Tablets, toddlers, and tantrums: The immediate effects of tablet device play." *Acta paediatrica (Oslo, Norway: 1992)* 110.1 (2021): 255.

[121] Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does gamification work?--a literature review of empirical studies on gamification. In *2014 47th Hawaii international conference on system sciences* (pp. 3025-3034). Ieee.

[122] Looyestyn, J., Kernot, J., Boshoff, K., Ryan, J., Edney, S., & Maher, C. (2017). Does gamification increase engagement with online programs? A systematic review. *PloS one*, *12*(3), e0173403.

[123] Radesky, J., Hiniker, A., McLaren, C., Akgun, E., Schaller, A., Weeks, H. M., ... & Gearhardt, A. N. (2022). Prevalence and characteristics of manipulative design in mobile applications used by children. *JAMA network open*, *5*(6), e2217641-e2217641.

[124] Fitton, D., & Read, J. C. (2019, June). Creating a framework to support the critical consideration of dark design aspects in free-to-play apps. In *Proceedings of the 18th ACM international conference on interaction design and children* (pp. 407-418).

player pays real or virtual currency to open a probability-based reward), which give teen users a rush of anticipation and are thought to contribute to compulsive/problematic gaming[125] and gaming-related financial harm.[126]

101. In summary, digital products including social media, video sharing platforms, and mobile games employ a variety of different design features that encourage repeated engagement with or extended use of their products. Studies tie many of these features to problematic media use or video gaming behaviors, while youth describe how such features can contribute to prolonged media use and displacement of healthy activities.

ONLINE HARMS OCCUR DUE TO DESIGN FEATURES LIKE 'DARK PATTERNS' THAT MANIPULATE OR DECEIVE YOUNG USERS

102. Dark patterns are deceptive and manipulative designs that are recognized internationally. For example, the OECD Committee on Consumer Policy defines them as: "Dark commercial patterns are business practices employing elements of digital choice architecture, in particular in online user interfaces, that subvert or impair consumer autonomy, decision-making or choice. They often deceive, coerce or manipulate consumers and are likely to cause direct or indirect consumer detriment in various ways, though it may be difficult or impossible to measure such detriment in many instances."[127]

103. The California Privacy Rights Act (2020) defined dark patterns as: "a user interface designed or manipulated with the substantial effect of subverting or impairing user autonomy, decision-making, or choice."

104. In practice, dark patterns shape the decisions made by children and teens online, such as what to purchase, what games to play, how long to play, and when to disengage and go do other things. Children may start playing a game because it looks fun or has a favorite character,

[125] González-Cabrera, J., Basterra-González, A., Ortega-Barón, J., Caba-Machado, V., Díaz-López, A., Pontes, H. M., & Machimbarrena, J. M. (2023). Loot box purchases and their relationship with internet gaming disorder and online gambling disorder in adolescents: A prospective study. *Computers in Human Behavior*, *143*, 107685.

[126] Carey, P. A. K., Delfabbro, P., & King, D. (2022). An evaluation of gaming-related harms in relation to gaming disorder and loot box involvement. *International Journal of Mental Health and Addiction*, *20*(5), 2906-2921.

[127] OECD (2022), Dark Commercial Patterns. OECD Digital Economy Papers, No 336, OECD Publishing

but then may receive pressure from characters in the game to make purchases,[128] be presented with countdown clocks and urgent messages while trying to make a decision,[129] or have their decision options obscured altogether. For instance, advertisements can be hidden behind objects that children can't resist tapping, like a sparkling birthday cake or favorite snowman character.[130]

105. The term "dark" is used to describe these designs because they are not always visible to users or may be designed to leverage human biases/instincts. However, in my research lab and others, when we train research assistants to recognize dark patterns in user interface design, they can reliably recognize such designs over 90% of the time.[131] Automated systems have been created to identify dark pattern designs at a large scale.[132] Thus, it is highly feasible to identify and mitigate dark patterns in digital products used by minors.

106. In a recent large-scale "mystery shopper" study,[133] 97% of the most popular websites and apps used by European consumers had at least one dark pattern, the most prevalent being (1) hidden information/false hierarchy, (2) preselection, (3) nagging, (4) difficult cancellations, and (5) forced registration. All of these dark pattern types nudge a user to make a decision that benefits the digital product (for example, signing up for a subscription or making an in-app purchase), not the user. Dark patterns often occurred together and included personalization by a user's prior behavior, which consumers found the hardest to resist.

107. The specific harms caused to minors by dark patterns include:

a. **Financial harms** from designs that promote excessive spending.

[128] Meyer, M., Adkins, V., Yuan, N., Weeks, H. M., Chang, Y. J., & Radesky, J. (2019). Advertising in young children's apps: A content analysis. *Journal of developmental & behavioral pediatrics*, *40*(1), 32-39.

[129] Radesky, J., Hiniker, A., McLaren, C., Akgun, E., Schaller, A., Weeks, H. M., ... & Gearhardt, A. N. (2022). Prevalence and characteristics of manipulative design in mobile applications used by children. *JAMA network open*, *5*(6), e2217641-e2217641.

[130] Meyer, M., Adkins, V., Yuan, N., Weeks, H. M., Chang, Y. J., & Radesky, J. (2019). Advertising in young children's apps: A content analysis. *Journal of developmental & behavioral pediatrics*, *40*(1), 32-39.

[131] Radesky, J., Hiniker, A., McLaren, C., Akgun, E., Schaller, A., Weeks, H. M., ... & Gearhardt, A. N. (2022). Prevalence and characteristics of manipulative design in mobile applications used by children. *JAMA network open*, *5*(6), e2217641-e2217641.

[132] Chen, J., Sun, J., Feng, S., Xing, Z., Lu, Q., Xu, X., & Chen, C. (2023, October). Unveiling the tricks: Automated detection of dark patterns in mobile applications. In *Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology* (pp. 1-20).

[133] European Commission: Directorate-General for Justice and Consumers, Lupiáñez-Villanueva, F., Boluda, A., Bogliacino, F., Liva, G. et al., *Behavioural study on unfair commercial practices in the digital environment – Dark patterns and manipulative personalisation – Final report*, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2838/859030

For example, in the FTC case against EPIC Games (the developer of the video game Fortnite),[134] numerous players and parents complained about design tricks that led to purchases of V-bucks (the game's currency) or in-game items without express consent. These designs included confusing buttons and a lack of confirmation that the player wanted to make the purchase, leading to thousands of accidental purchase claims submitted to EPIC.

b. Many studies show that artificial pressure from e-commerce dark patterns such as count-down clocks and false scarcity lead to consumers making impulsive purchasing decisions.[135]

c. **Privacy harms:** Large-scale studies of cookies banners (the notices that appear at the bottom of website screens with information about cookies-based data collection) show a high prevalence of dark pattern designs,[136] which influence users to share their data when they would prefer not to.[137]

d. **Extended time online:** In our review of mobile games played by young children, 64.7% contained at least one dark pattern designed to prolong gameplay, such as pressure from characters, obscured options for navigating away from the game, and rewards presented at the ends of levels to entice the child to keep playing.[138] Dark

[134] Federal Trade Commission, 'FTC Finalizes Order Requiring Fortnite maker Epic Games to Pay $245 Million for Tricking Users into Making Unwanted Charges' (March 2023): https://www.ftc.gov/system/files/ftc_gov/pdf/1923203epicgamesfinalconsent.pdf

[135] Wu, Y., Xin, L., Li, D., Yu, J., & Guo, J. (2021). How does scarcity promotion lead to impulse purchase in the online market? A field experiment. *Information & Management*, *58*(1), 103283.

[136] Krisam, C., Dietmann, H., Volkamer, M., & Kulyk, O. (2021, October). Dark patterns in the wild: Review of cookie disclaimer designs on top 500 German websites. In *Proceedings of the 2021 European Symposium on Usable Security* (pp. 1-8).

[137] Borberg, I., Hougaard, R., Rafnsson, W., & Kulyk, O. (2022). So I sold my soul": Effects of dark patterns in cookie notices on end-user behavior and perceptions. In *Usable Security and Privacy (USEC) Symposium* (Vol. 2022).

[138] Radesky, J., Hiniker, A., McLaren, C., Akgun, E., Schaller, A., Weeks, H. M., ... & Gearhardt, A. N. (2022). Prevalence and characteristics of manipulative design in mobile applications used by children. *JAMA network open*, *5*(6), e2217641-e2217641.

> patterns often work in combination with one another; for example, in our recent analysis of very large online platforms,[139] each social media app employed 20 or more different dark patterns that appear designed to extend use.

108. When teens experience dark patterns, for example in gaming environments, they state that it causes them emotional distress, cognitive burden, weakened attention (from having to constantly resist design features trying to capture their attention and urging them to do things), and financial distress/pressure (spending more than they wanted). They also felt they had to provide data when they didn't want to.[140]

STRATEGIES TO MITIGATE ONLINE HARMS

109. Digital products have a responsibility to mitigate the harms that occur to minors.

110. Although some social media platforms have made attempts to mitigate harms by offering teen accounts with more privacy features, filtered content, or time limits, without transparency and accountability, we don't know whether these measures actually mitigate harms. We also don't know how many youth users turn these settings off.

111. There are now several global initiatives embracing safety-by-design and privacy-by-design approaches for minors. These include several content-agnostic approaches such as preventing profiling of minors, reducing extended use, reducing product features that quantify approval, and increasing accountability so that users know what the risks are and that their flags or reports are responded to.

112. Youth, parents, the Biden-Harris Interagency Task Force on Kids Online Health and Safety, the American Psychological Association,[141] and the National Academies of Science

[139] Chen, Y., Fu, Y., Chen, Z., Radesky, J., Hiniker, A. Extended-Use Designs on Very Large Online Platforms. Available at: https://export.arxiv.org/pdf/2411.12083

[140] Sanchez Chamorro, L., Lallemand, C., & Gray, C. M. (2024, July). " My Mother Told Me These Things are Always Fake"-Understanding Teenagers' Experiences with Manipulative Designs. In *Proceedings of the 2024 ACM Designing Interactive Systems Conference* (pp. 1469-1482).

[141] American Psychological Association. (2024). Potential risks of content, features, and functions: The science of how social media affects youth. Available at: https://www.apa.org/topics/social-media-internet/youth-social-media-2024

and Medicine (NASEM) report recommend that such features be uniform across products. Specifically, NASEM recommended age-appropriate design features including:

a. Enhanced privacy protections
b. Auditing features, identifying their risks, and mitigating them
c. Discouraging persuasive design features that extend use or re-engagement
d. Algorithmic responsibility for what content is promoted

113. Digital literacy interventions are necessary but insufficient. As the NASEM report notes, "the complexity and pace of the online environment far exceed what adolescents—or any layperson—could be reasonably expected to understand."

114. Solutions are feasible. For example, experiments described in the academic literature reviewed above include innovative designs such as:

a. Options to increase the time that ephemeral content is available, or event/content recorders that allow a user to see ephemeral content the next time they are online
b. Batching and muting of notifications at particular times of day (school hours, overnight hours)
c. Providing options for additional friction in feeds after a certain usage duration or at a particular time of day/night
d. Status settings that normalize being away from platforms.
e. Hiding social quantification (e.g., likes, follower counts) for minors
f. Platform home pages that remove recommendation feeds and promote user agency

CALIFORNIA CHILDREN'S AGE-APPROPRIATE DESIGN CODE ACT

115. The California Children's Age-Appropriate Design Code Act would help children have healthier relationships with digital technology in several ways.

116. By setting minors' accounts to private by default, the Act would take a critical step

in preventing exploitation of children and teens.

117. By preventing profiling of minors, the Act would reduce their exposure to illegal activities such as sexual exploitation, gambling, and alcohol, and would prevent manipulative pricing and nudges during video games that contribute to excessive spending.

118. The Act addresses design features that extend digital media use and displace healthy activities such as sleep. Children, teens, and families currently struggle to manage boundaries around media use and need design options that support disengaging from media when they so choose.

119. Finally, the Act would address dark patterns that manipulate minors into spending more money or time on digital products.

120. The data privacy and design standards established by the Act will be crucial for the safety of emerging digital products. For example, these standards would prevent artificial intelligence-enabled chatbots and companions from using manipulative designs to encourage engagement, or from using the highly sensitive information collected in conversations with minors for marketing purposes.

OPINIONS

121. Children and teens have generated billions of dollars in revenue for internet services and mobile apps that keep them engaged through profiling and design features that capture and hold onto their attention. These design features—including infinite scroll, autoplay, notifications that ping for attention without regard for whether a young user is trying to sleep or focus on classwork, and designs that make users afraid of losing social status if they don't return to the platform again and again—contribute to extended use and feelings of frustration and regret. In our individualistic society, users typically blame themselves for being "addicted" or wasting their time online; yet, this is not a matter of individual weakness in children and teens. At a digital ecosystem level, the designs at the root of these feelings are pervasive, are purposeful, and are wholly changeable.

122. Over the past few years, investigations into the internal research conducted by

large online platforms have revealed fascinating insights about experiments run on design features and how they engage users. Design choices such as likes, time-limited ephemeral posts, and notifications have been created with clear business objectives, but come with costs to child and teen sleep, social pressure, and distraction.

123. Global movements for safety- and privacy-by-design are not moral panics. They are precise attempts to improve product safety by removing features that increase risk of harm and providing more user control and transparency. Considering that many minors use digital products for more than half of their waking hours, it is crucial that these products be designed in ways that support their wellbeing.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on December 5, 2024 at Ann Arbor, Michigan.

Dr. Jenny S. Radesky

EXHIBIT 1

Jenny Radesky

Associate Professor
734-647-3759 - jradesky@umich.edu

Education and Training

Education

08/1997-05/2001	BA, Johns Hopkins University, Baltimore, MD
08/2002-06/2007	MD, Harvard Medical School, Boston, MA

Postdoctoral Training

07/2007-06/2010	Residency, Pediatrics, University of Washington/Seattle Childrens Hospital, Pediatrics, Seattle, WA
07/2011-06/2014	Clinical Fellow, Developmental Behavioral Pediatrics, Boston University School of Medicine, Pediatrics, Boston, MA

Certification And Licensure

Certification

10/2010-12/2020	American Board of Pediatrics, General
01/2015-12/2025	American Board of Pediatrics, Developmental Behavioral Pediatrics

Licensure

	Michigan, Controlled Substance
	Michigan, Medical License
01/2016-Present	Michigan, Medical License
01/2016-Present	Michigan, DEA License
01/2016-Present	Michigan, Controlled Substance

Work Experience

Academic Appointment

07/2014-01/2016	Assistant Professor, Pediatrics, Boston University School of Medicine, Boston
01/2016-08/2022	Assistant Professor, Pediatrics, University of Michigan - Ann Arbor, Ann Arbor
09/2022-Present	Associate Professor in Pediatrics - Development - Behavioral, Pediatrics, University of Michigan - Ann Arbor, Ann Arbor, (Tenured)

Clinical Appointments

08/2010-06/2011	Pediatrician, Pediatric Associates Inc, Bellevue, WA

Research Interests

- My research examines parent mobile device use, young children's use of mobile and interactive media, parent-child interaction, and social-emotional development.

Clinical Interests

- Advocacy, underserved populations, autism spectrum disorder, early childhood

Grants

Current Grants

Children and Technology Advisor - Jenny Radesky - FTC IPA:
PI
FTC-US
07/2024 - 06/2025
$63,115

P01HD109907:*Growing up in a Digital World: A synergistic approach to understanding media use in children ages 1-8:*
PI
NIH-DHHS-US-SubK sourced funding through Georgetown University
09/2022 - 08/2025
$279,142

K23HD105988:*Longitudinal associations of maternal mobile device use and maternal-infant wellbeing:*
Consultant on (Principal Investigator:Tiffany Munzer)
NIH-DHHS-US
07/2022 - 06/2027
$837,000

R01HD102370:*Technology Use and Emerging Executive Functioning in Early Childhood:*
PI
NIH-DHHS-US
04/2021 - 03/2026
$2,873,938

Submitted - Open

R01:*Thriving in a Digital World: Examining Trajectories of Healthy and Problematic Media use from Childhood to Early Adolescence:*
PI
NIH-DHHS-US-SubK sourced funding through Brigham Young University
04/2025 - 03/2030
$53,367

Past Grants

P01HD109907:*Growing up in a Digital World: A synergistic approach to understanding media use in children ages 0-8:*
PI
NIH-DHHS-US-SubK sourced funding through Georgetown University
09/2023 - 08/2024
$28,409

SAMHSA Center of Excellence on Social Media and Mental Health:
PI
SAMHSA-DHHS-US-SubK sourced funding through American Academy of Pediatrics
09/2022 - 09/2024
$224,795

Planning the Metaverse for Kids: Social Gaming Walk-Through Study:
PI
Children's Hospital Corporatio
06/2022 - 05/2024
$121,830

Teen Smartphone Pilot:
PI
Common Sense Media
02/2022 - 05/2023
$60,798

Pediatric Early Autism Recognition System: PEARS:
Mentor (Principal Investigator:Nicole Hamp)
BCBSM
09/2021 - 12/2022
$9,100

R21NR019402:*Healthy Digital Habits in Parents of Infants:*
PI
NIH-DHHS-US-SubK sourced funding through Parkview Hospital, Inc
05/2021 - 04/2023
$57,255

YouTube Content Analysis:
PI
Common Sense Media
02/2021 - 04/2022
$45,600

YouTube Content Analysis:
PI
Common Sense Media
01/2020 - 01/2021
$21,386

R41HD:*Beyond Screen Time: Developing an objective mobile media measurement tool:*
PI
NIH-DHHS-US-SubK sourced funding through Open Lattice, Inc.
10/2019 - 08/2020
$51,166

R41HD100230:*Beyond Screen Time: Developing an objective mobile media measurement tool:*
Funded by
Eunice Kennedy Shriver National Institute of Child Health and Human Development
09/2019 - 08/2020
$150,000

R21HD094051:*Longitudinal associations between preschooler emotion regulation, executive function, and digital media use.:*
PI
NIH-DHHS-US
08/2018 - 07/2021
$429,000

R03HD094077:*Parent-toddler interactions during electronic versus print book reading:*
PI
NIH-DHHS-US
08/2018 - 07/2020
$156,000

K23HD092626:*Parent Mobile Device Use and Parent-Child Interaction:*
PI
NIH-DHHS-US
08/2017 - 05/2022
$793,103

Electronic versus print books: Differences in parent-toddler interactions and toddler behavioral regulation:
Mentor (Principal Investigator:Tiffany Munzer)
Academic Pediatric Association
03/2017 - 10/2018
$14,780

Honors and Awards

National

2017	AAP Communication and Collaboration Award, American Academy of Pediatrics
2019	Student Research Award, Academic Pediatric Association, Mentor, Marisa Meyer
2023	AAP Innovation Award, American Academy of Pediatrics, For the Family Media Plan

Institutional

2001	Phi Beta Kappa, Johns Hopkins University
2007	New England Pediatric Society Prize, Harvard Medical School
2007	Presidential Scholars Program, Public Service Initiative, Harvard Medical School, Provided loan forgiveness for graduates who worked in subspecialities focusing on public service
2013 - 2014	Zuckerman Fellowship, Boston University School of Medicine, Pediatrics
2017 - 2018	Elizabeth Caroline Crosby Award, University of Michigan, ADVANCE Program
2018	Top Teacher Award, University of Michigan Medical School, Pediatrics

Study Sections, Editorial Boards, Journal & Abstract Review

Study Sections

International

2020 - Present	Advisory Board (supported by UNICEF), Power of Zero Anti-Bullying Initiative, (Standing Member)

National

2019 - 2022	Study Section, NICHD Study Section, (Ad Hoc)
2020 - Present	Advisory Board, Common Sense Media Early Childhood Initiative, (Standing Member)
2021 - Present	Advisory Board, Child Trends News Service for 2 NSF grants, Child Trends, (Standing Member)

2023 - 2024	Rudd Center Healthy Eating Research Digital Advertising Expert Panel, (Standing Member)
2024 - Present	Board on Children Youth and Families, National Academies of Science, Engineering, and Medicine, (Standing Member)
2024	SBIR Study Section, NICHD Study Section, (Ad Hoc)

Editorial Boards / Journal & Abstract Reviews

Editorial Boards

2017 - 2020	Editor, Developmental Behavioral Pediatrics, New England Journal of Medicine Journal Watch: Pediatrics and Adolescent Medicine
2018 - 2019	Editor, Challenging Cases, Journal of Developmental Behavioral Pediatrics
2019 - 2020	Guest Editor, Cyberpsychology, Behavior, and Social Networking special issue on Children and Smartphones

Journal Review

2011 - 2023	JAMA Pediatrics
2012	Archives of Disease in Childhood
2013	International Journal of Affective Disorders
2014 - 2023	Pediatrics
2015	Infancy
2015	Early Human Development
2015 - 2017	Maternal Child Health Journal
2015 - 2024	Journal of Developmental Behavioral Pediatrics
2017	PLOS One (Ad Hoc)
2017 - 2020	Computers in Human Behavior (Ad Hoc)
2018 - 2019	Child Development (Ad Hoc)
2019	BMJ Open
2020	Infant Behavior and Development
2020 - 2023	Acta Paediatrica
2021	Journal of Children and Media
2021	New England Journal of Medicine (Ad Hoc)
2021	Journal of Medical Internet Research (Ad Hoc)
2021 - 2024	JAMA Network Open

Teaching

Mentorship

Resident

07/2018-05/2019	Rebecca Lane, University of Michigan Medical School, Publication of review/commentary
08/2022-Present	Sarah Frankl, University of Michigan Medical School, Pediatric Neurology, Manuscript in preparation

Faculty Member

07/2019-Present	Tiffany Munzer, University of Michigan Medical School, Multiple publications and national presentations
09/2022-Present	Elizabeth Milkovich, Children's Mercy Hospital, Applying for K23 award
09/2023-Present	Sarah DeHaan, University of Michigan Medical School, General Pediatrics, Mentoring as mini-fellow in DBP; Project in progress

Clinical Fellow

07/2016-06/2019	Tiffany Munzer, University of Michigan Medical School, Multiple publications and conference presentations
07/2018-06/2021	Chioma Torres, University of Michigan Medical School, 3 publications
08/2019-Present	Nicole Hamp, University of Michigan Medical School, 1 publication, 1 national presentation, 1 manuscript in preparation
01/2020-06/2021	Kimberley Levitt, University of Michigan Medical School, 1 publication, 1 manuscript in preparation

Medical Student

09/2021-09/2023	Nirmeen Chouaib, Michigan State University, Manuscript

Graduate Student

07/2019-Present	Kaiwen Sun, University of Michigan School of Information, Multiple publications and international presentations

Undergraduate Student

10/2017-01/2021	Marisa Meyer, University of Michigan, 2 publications; 2 national presentations; 2019 APA best abstract award; Mentee won Dept of Psychology award for her thesis, which I mentored
07/2019-09/2020	Fangwei Zhao, University of Michigan, Publication
09/2019-09/2022	Caroline McLaren, University of Michigan, 2 publications
05/2024-Present	Madalynn Woods, University of Michigan, Psychology, SRCD abstract, manuscript in submission

Teaching Activity

International

01/2024-01/2024	Keynote at Early Childhood Conference, VIA University, Denmark

National

04/2015-04/2015	Pediatric Academic Societies State-of-the-Art Plenary: "Parent media use and parent-child interaction." (San Diego, CA)
04/2016-04/2016	2016 Pediatric Academic Societies Topic Symposium: "Digital Technology and the Word Gap: Barrier or Opportunity?" (Baltimore, MD)
05/2017-05/2017	2017 Pediatric Academic Societies, Developmental Behavioral Pediatrics Special Interest Group. "Digital Media and Child Development: Policy Perspectives." (San Francisco, CA)
05/2017-05/2017	2017 Pediatric Academic Societies Plenary Lecture. "Digital Media Use and Cognitive Self-Regulation." (San Francisco, CA)
10/2017-10/2017	2017 Society for Developmental Behavioral Pediatrics, Annual Conference. "Autism Spectrum Disorder and Digital Media." (Cleveland, OH)
11/2017-11/2017	Obesity Week Conference. "Using technology to measure technology." (Washington D.C.)

05/2018-05/2018	2018 Pediatric Academic Societies, Invited Science Chair, "Digital Media and Vulnerable Populations." (Toronto, Canada)
11/2018-11/2018	2018 American Academy of Pediatrics National Conference and Exhibition: "Digital Media and Early Childhood: The Good, The Bad, and the Unknown." (Orlando, FL)
04/2019-04/2019	Pediatrics Academic Societies Annual Conference, Topic Symposium "Digital Natives: The Changing Nature of Children's Media Use" (Baltimore MD)
10/2019-10/2019	American Academy of Pediatrics National Conference and Exhibition. "Social Media: The Good, Bad, and Unknown" (New Orleans, LA)
10/2019-10/2019	American Academy of Pediatrics National Conference and Exhibition. "Advertising in Apps for Young Children." (New Orleans, LA)
10/2019-10/2019	American Academy of Pediatrics National Conference and Exhibition Plenary Presentation: "Gamified Childhood" (New Orleans, LA)
10/2020-10/2020	2020 American Academy of Pediatrics National Conference an Exhibition, "Digital Health: Helping Families Navigate Digital Media." (Virtual Conference)
03/2023-03/2023	Lecture regarding social media, technology, and youth mental health, Fairfax School Health Advisory Council, Guest Lecturer
07/2023-07/2023	Training on children and media for social workers and child welfare professionals in California, Center for Innovation and Resources, Inc
09/2023-11/2023	ECHO 6-week course on Social Media and Youth Mental Health, American Academy of Pediatrics, ECHO Course Director
09/2023-09/2023	Expert roundtable on social media and youth mental health, White House Interagency Task Force on Kids Online Safety, Roundtable member
11/2023-11/2023	Training for educators on child/adolescent social media use, National Center for Safe Secure Learning Environments, Panelist
11/2023-02/2024	ECHO 6-week course on Social Media and Youth Mental Health, American Academy of Pediatrics, ECHO Course Lead
12/2023-12/2023	Web-based Workshop on Healthy Media Use, Boston Public Schools
09/2024-Present	Workshop: Strengths-based approaches to supporting healthy media use in primary care, American Academy of Pediatrics, Workshop director

Regional

03/2014-03/2014	Steven J. Parker Memorial CME Course in Developmental Behavioral Pediatrics. "Smartphone: Friend or Foe?" (Boston, MA)
03/2015-03/2015	Steven J. Parker Memorial CME Course in Developmental Behavioral Pediatrics. "Colic, Tantrums, and Sleep: Self-regulation Problems in Early Childhood" (Boston, MA)
05/2015-05/2015	New England School Nurse Association Annual Continuing Education Conference. "Digital Technology Use and Child Development." (Portsmouth, NH)
04/2016-04/2016	Michigan Head Start Medical Advisory Committee. "Mobile Media Use and Child Social-Emotional Development." (Lansing, MI)
09/2016-09/2016	Michigan Chapter, American Academy of Pediatrics 2016 Annual Conference. "The ABCs of IEPs." (Boyne, MI)
11/2016-11/2016	Saint Joseph's Hospital Pediatric Grand Rounds. "Digital Technology and the Word Gap: Barrier or Opportunity?" (Ypsilanti, MI)
04/2017-04/2017	HighScope International Conference. "Family Technology Use: How to Implement Evidence-based Family-Centered Practices" (Detroit, MI)
06/2017-06/2017	Saint Joseph's Hospital Pediatric Grand Rounds. "The ABCs of IEPs." (Ypsilanti, MI)

08/2017-08/2017	Washtenaw Intermediate School District Early Childhood Conference. "Digital Media and Early Childhood: The New AAP Guidelines and Early Childhood Education." (Ann Arbor, MI)
03/2018-03/2018	Michigan Head Start Association annual meeting. "Preschoolers and Touchscreens." (Ann Arbor, MI)
10/2018-10/2018	Michigan Department of Health and Human Services Autism Training Program: "The ASD Team: Perspective from a Developmental Behavioral Pediatrician" (Michigan statewide webinar)
03/2019-03/2019	Michigan Head Start Association Annual Conference. "Apps and Young Brains." (Ann Arbor, MI)
08/2019-08/2019	Hurley Children's Hospital Grand Rounds "Digital Media and Early Childhood: The Good, The Bad, and the Unknown." (Flint, MI)
01/2020-01/2020	Osher Lifelong Learning Institute. "Digital Media and Parent-Child Interaction." (Ann Arbor, MI)
07/2020-07/2020	Ascension Hospital Pediatrics Grand Rounds: "Beyond Screen Time: The Importance of Relationships, Design, and Disparities." (Detroit, MI - presented virtually)
10/2020-10/2020	Ann Arbor Public Schools, Lawton Elementary School Parent-Teacher Organization. "Surviving Remote Learning" (Ann Arbor, MI - presented virtually)
10/2022-10/2022	Media and Child Wellbeing: Thinking Beyond Screen Time, Ann Arbor Public Schools PTO, Guest Lecturer
11/2022-11/2022	Screen Media and Child Wellbeing, Michigan Medicine Project Healthy Schools, Guest Lecturer
01/2023-01/2023	Pediatric Early Autism Recognition System, UM Collaborative Office Rounds, Guest Lecturer
05/2023-05/2023	Parent workshop about media and child development, Unified Child and Family Head Start
08/2023-08/2023	Professional Training on Children and Media - Early Childhood and Elementary Teachers, Oakland Intermediate School District
10/2023-10/2023	Workshop for parents about healthy media use, Saline Public Schools, Workshop Leader
02/2024-02/2024	Workshop for parents about healthy digital relationships with media, Emerson School
02/2024-02/2024	Webinar on Digital Media and Child Mental Health, MC3
03/2024-Present	Webinar for early child care providers about media use, Child Care Network of Southeast Michigan, Guest lecturer
04/2024-Present	Webinar for parents about healthy screen use, Monroe Intermediate School District, Guest lecturer
05/2024-Present	Webinar on social media and youth mental health, Coalition for a Drug-Free Baltimore, Guest lecturer

Institutional

04/2012-04/2012	Pediatric Grand Rounds, Boston Medical Center: "Unsoothable infant crying and risk of maternal depression."
11/2012-11/2012	Pediatric Case of the Week, Boston Medical Center: "We don't want meds: Nonpharmacologic approaches to ADHD management."
04/2013-04/2013	Pediatric Grand Rounds, Boston Medical Center: "Behavioral antecedents of early media exposure."
01/2014-01/2015	Fellow Support Rounds (monthly), Boston Medical Center Division of Developmental Behavioral Pediatrics

01/2014-01/2015	Media and Early Childhood Development lecture, pediatric interns
04/2014-04/2014	Pediatric Grand Rounds, Boston Medical Center. "Patterns of Mobile Device Use by Caregivers of Young Children During Fast Food Meals"/"Are Children with Self-Regulation Problems Differentially Susceptible to Early Parenting?"
07/2015-07/2015	Pediatric Grand Rounds, University of Michigan. "Mobile Media Use, Parent-Child Interaction, and Child Social-emotional Development."
09/2015-09/2015	Pediatric Grand Rounds, Boston University School of Medicine. "Mobile Media Use, Parent-Child Interaction, and Child Social-emotional Development."
12/2015-12/2015	Harvard Combined Neonatology Fellowship Research Lecture Series. "Mobile Media Use, Parent-Child Interaction, and Child Development."
12/2016-12/2016	University of Michigan Interactive and Social Computing Consortium. "Early Childhood Media Use."
03/2017-03/2017	University of Michigan Autism Spectrum Disorder CME. "After ASD Diagnosis: IEPs, Non-ABA Treatment Options, and Parent Support"
07/2017-07/2017	University of Michigan Department of Pediatrics Grand Rounds. "Digital Media and Early Childhood: Update on the New AAP Guidelines."
09/2017-09/2017	University of Michigan CHEAR (Child Health Evaluation and Research) Unit conference. "Using apps to measure parent and child mobile device use: Opportunities and Limitations."
10/2017-10/2017	University of Michigan Child Psychology Trainee Lunch Series. "Digital Media and Early Childhood."
12/2018-12/2018	University of Michigan T32 Training Program in Developmental Science: "Digital Media and Early Childhood: Clinical Cases and Evidence Base"
03/2019-03/2019	University Center for Child and Family, Ann Arbor, MI – Trainee case conference: "Media and Mental Health."
01/2020-01/2020	University of Michigan School of Communication and Media invited lecture. "Naturalistic Methods for Studying Child and Parent Media Use."
01/2020-01/2020	Michigan Privacy Symposium, University of Michigan School of Information. "Children and Technology."
01/2020-01/2020	Center for Human Growth and Development T32 seminar, "Working with the Media"
05/2020-05/2020	Michigan Medicine Department of Pediatrics Grand Rounds: "Beyond Screen Time: The Importance of Relationships, Design, and Disparities."
09/2020-09/2020	Michigan Medicine Pediatrics Residency, "Attachment and Parenting in Early Childhood"
04/2021-04/2021	Child Psychology Practicum Lecture, Department of Psychiatry, Michigan Medicine
08/2023-08/2023	Autism Bootcamp, Developmental Behavioral Pediatrics Fellowship
12/2023-12/2023	Noon conference: Strategic Science to Inform Child Policy, University of Michigan Medical School, Pediatrics, Division of Child Neurology

Dissertation Committees

01/2021-Present	Kaiwen Sun, Interactive Media and Child Development, University of Michigan, School of Information, Committee Member
10/2021-Present	Olivia Richards, University of Michigan, School of Information, Committee Member

Preliminary Committee

06/2024-Present	Cami Goray, Public perceptions of digital privacy and age assurance, University of Michigan, School of Information, Committee Member

Memberships in Professional Societies

2002 - 2020	Member, Massachusetts Medical Society
2007 - Present	Fellow, American Academy of Pediatrics
2012 - Present	Member, Academic Pediatric Association
2012 - Present	Member, Society for Developmental Behavioral Pediatrics
2014 - 2016	Member, Contextual Influences Working Group, Bridging the Word Gap National Research Network
2018 - Present	Member, Society for Pediatric Research

Committee/Service

International

2019 - 2023	Board of Directors, Melissa and Doug, LLC, Board of Directors

National

2015 - Present	Council on Communications and Media, American Academy of Pediatrics, Member
2016	National Conference and Exhibition Peds21 Planning Committee, American Academy of Pediatrics, Other, Abstract Chairperson
2017	Council on Communications and Media, Media Visiting Professor Selection Committee, American Academy of Pediatrics, Member
2018	NICHD Strategic Planning Committee, National Institutes of Child Health and Development, Member
2021 - 2023	Council on Communications and Media, American Academy of Pediatrics, Vice Chair
2023 - Present	Council on Communications and Media, American Academy of Pediatrics, Chair
2023	Interagency Task Force on Social Media and Youth Mental Health, United States Government, Other, Scientific subject matter expert

Regional

2016 - Present	Medical Advisory Board, Autism Alliance of Michigan, Member
2017 - 2023	Board of Directors, Child Care Network of Southeast Michigan, Secretary
2019	Flint Water Crisis Community Advisory Board, University of Michigan, Member
2019 - 2020	Autism Evaluation and Treatment Working Group, Michigan Department of Health and Human Services, Member

Institutional

2007 - 2010	Residency curriculum planning committee, University of Washington/Seattle Children's Hospital, Member
2008 - 2009	Intern selection committee, University of Washington/Seattle Children's Hospital, Member
2015	Department of Pediatrics, Chair's Strategic Planning Committee, Boston University School of Medicine, Member
2018	Zero to Thrive Faculty Selection Committee, University of Michigan Medical School, Member

2020 - 2022	Admissions Interviewer, University of Michigan Medical School, Member
2020 - 2023	Department of Pediatrics Research Symposium Planning Committee, University of Michigan Medical School, Officer
2023	Health Equity Steering Committee, University of Michigan, Member

Departmental

2022 - Present	Tenure Track Promotions Committee, University of Michigan Medical School Department of Pediatrics, Member

Scholarly Activities

Presentations

Visiting Professorship

Keynote

1. Digital Media and Parent-Child Relationships, University of Lille, 11/2019, Lille, France

Extramural Invited Presentation

Keynote

1. AAP Council on Communications and Media Visiting Professorship, University of Illinois, Chicago, 05/2016, Chicago
2. Digital Media and Literacy/Social-Emotional Development., Akron Children's Hospital, 05/2017, Akron, OH
3. Commercialism is the Missing Link, Children's Screen Time Action Network, 04/2018, Boston, MA
4. Empowering Parents in the Digital Age: Supporting Parent-Child Interactions, Denver Health (Early Childhood Lectureship), 04/2018, Denver, CO
5. Digital Media and the Dyad, World Association of Infant Mental Health, 05/2018, Rome, Italy
6. Digital Media and Parent-Child Interaction, Hospital for Sick Kids Infant Mental Health Program, 02/2019, Toronto, Canada
7. (Keynote Presentations) "Practical Strategies for Addressing Digital Media in Primary Care" and "Digital Media and Early Childhood Outcomes.", University of Wisconsin - Madison, 09/2019, Madison, WI
8. The Digital Playground, MIPJunior, 10/2020, Cannes, France (Presented virtually)
9. Keynote Lecture: Moving Beyond "Screen Time:" Advocating for a Child-Centered Digital Environment, ACM Interaction Design and Children, 06/2021, Athens, Greece (virtual)
10. Digital Media and Child Development: Beyond Screen Time, **Radesky J**, Slovenian Pediatric Society, 09/2022, Bled, Slovenia
11. Stretching Beyond Your Comfort Zone: How Different Lenses and Methods Can Improve Child Health Research, **Radesky J**, Georgetown University Medical Center - Collaborative for Research and Education to Advance Children's Health, 12/2022, Washington, DC (virtual)
12. Social Media and Adolescent Mental Health, **Radesky J**, Hassenfeld Child Health Innovation Institute, 05/2023, Providence, RI
13. Assessing and Managing the Effects of Social Media on Children, **Radesky J**, Lecture for pediatricians on social media and child mental health, Inaugural Rucola Lecture in Pediatrics, 11/2023, Chicago, IL (virtual)
14. Digital Media and Early Childhood, **Radesky J**, Presentation to early childhood practitioners in Denmark, Danish Early Childhood Annual Conference (Smabornekonferencen), 01/2024, Nyborg, Denmark
15. Digital Wellbeing in Early Childhood: Research Updates, **Radesky J**, Digital wellbeing advisory board keynote, Sesame Workshop, 02/2024, New York, NY

16. Screens and Young Children: Strengths-based approaches to support early mental and relational health, **Radesky J**, New York State Early Childhood Technical Assistance Center, 05/2024, New York, NY (virtual)

17. The 5 Cs of Media Use: Early Childhood, **Radesky J**, American Academy of Pediatrics, 05/2024, Washington, DC

18. What Ever Happened to Children's Television?, Radesky J, International Conference on Infant Studies, 07/2024, Glasgow, Scotland

19. Social Media and Student Mental Health, **Radesky J**, Mental Health America – New York State. 2024 Summer Academy for Mental Health, 08/2024, New York, NY (virtual)

20. New approaches to address social media and youth mental health, **Radesky J**, American Academy of Pediatrics National Conference and Exhibition, 09/2024, Orlando, FL

21. Healthy relationships with social media, from birth to adolescence, Radesky J, Montana Chapter AAP, 10/2024, Helena, MT

22. Social Media and Adolescent Mental Health, **Radesky J**, Vermont Child Health Improvement Program, 10/2024, Burlington, VT

Speaker

1. Digital Media and Parent-Child Interaction., Reach Out and Read, 05/2017, Denver, CO

2. A Pediatric Perspective on the Impact of Early Media Exposure, National Institute of Child Health and Development, 01/2018, Bethesda, MD

3. Differences in parent-toddler interactions when reading electronic versus print books, Reach Out and Read National Leadership Conference, 05/2018, Cincinnati, OH

4. Digital Media and Parent-Child Interaction, University of California - San Francisco Department of Pediatrics Grand Rounds, 06/2018, San Francisco, CA

5. Parent Technology Use and Parent-Child Interaction, Digitaler Alltag mit Kindren (Digital Everyday Life with Children) conference, Universitats-Kinderspital, 08/2018, Zurich, Switzerland

6. Parent Technology Use and Parent-Child Interaction, Public Health Ontario - Infant Mental Health, 10/2018, Ontario, Canada

7. How Early Childhood Programs Can Support Media Literacy Education, National Leadership Forum, Alliance for Media Literacy in Early Childhood. Erikson Institute, 01/2019, Chicago, IL

8. Screen Media Best Practices: Integrating Media Guidance into Parent-Child Work, ZERO TO THREE, 10/2019, Fort Lauderdale, FL

9. The Digital Playground: App Design, Data Collection, and Policy Implications, U.S. Federal Trade Commission COPPA Workshop, 10/2019, Washington, DC

10. Early use of old (and new) Media and Children's Cognitive Development., University of California - San Diego Department of Pediatrics (Welsh Lectureship), 01/2020, San Diego, CA

11. Digital Media and Parent-Child Interaction, Connecticut Children's Hospital Grant Rounds, 04/2020, Hartford, CT

12. How Digital Media are Shaping Children's Relationships with Parents and the World, ZERO TO THREE Board of Directors Annual Meeting, 05/2020, Washington, DC

13. Advocating for Children's Digital Environments, Reach Out and Read, 06/2020, Webinar

14. Digital Media, Parent-Child Interaction, and Social-emotional Development, Mind HK (Hong Kong Mental Health Conference), 11/2020, Hong Kong (virtual)

15. Advertising and Children, Institute for Digital Media and Child Development, 11/2020, New York, NY (virtual)

16. Demystifying Digital Design and its Impact on Parent-Child Interaction, ZERO TO THREE New York, 01/2021, New York, NY (virtual)

17. Families and Digital Media Use During COVID-19, Connecticut Children's Hospital, 03/2021, Hartford, CT

18. "Optimal Defaults" in Children's Digital Spaces: Relevance for Policy, Research, and Clinical Guidance, Children's Hospital of Philadelphia Grand Rounds, 04/2021, Philadelphia, PA

19. The Science Behind Why Pediatricians Prescribe Play, US Play Coalition National Conference, 04/2021, Virtual

20. The Digital Environment and Child Development: Sorting Facts from Fears, Pediatric Academic Societies, 05/2021, Virtual

21. The role of design and monetization in media's effect on child wellbeing, **Radesky J**, National Academy of Science, 02/2023, Washington, DC (virtual)

22. Strategic Science for Child Technology Policy, **Radesky J**, Designed with Kids in Mind Advocacy Coalition, 02/2023, Washington, DC

23. Spokesperson Training: Social Media and Mental Health, **Radesky J**, Training for AAP spokespeople, American Academy of Pediatrics, 08/2023, Washington, DC (virtual)

24. Social Media and Mental Health in Children and Adolescents, **Radesky J**, Training for pediatricians and mental health professionals, North Dakota Child Psychiatry Access Program, 09/2023, North Dakota, US (virtual)

25. Important Concepts in Social Media and Youth Mental Health, **Radesky J**, AAP COCM H-session, American Academy of Pediatrics, 10/2023, Washington, DC

26. Digital Media, Causality, and Mental Health, **Radesky J**, Invited workshop on social media, child wellbeing, and the law, Columbia Knight First Amendment Institute, 01/2024, New York, NY

27. The Evidence Base for Child Technology Regulation, **Radesky J**, Training for AAP leaders, American Academy of Pediatrics, 03/2024, Washington, DC (virtual)

28. Beyond Screen Time: Researching Child media Use Through Relational and Design Lenses, Radesky J, New York University, 05/2024, New York, NY (virtual)

29. Social Media and Youth Mental Health, **Radesky J**, Ascension Hospital Pediatric Grand Rounds, 06/2024, New Jersey (virtual)

30. Child Development in a Virtual World, **Radesky J**, National Academies of Science Engineering and Medicine, 09/2024, Washington, DC (virtual)

31. Social Media and Youth Mental Health, Radesky J, Tecnologico de Monterrey Medical School, 11/2024, Monterrey, Mexico (virtual)

Panel

1. Children and Technology, Common Sense Media, 02/2018, Washington, DC

2. What do children understand about IoT, and how are they vulnerable?, IoT of Toys Conference - Developing a US-EU Public Interest Strategy, 02/2018, Washington, DC

3. Hooked on Tech?, Family Online Safety Institute, 11/2018, Washington, DC

4. Senate Roundtable: Children and Media Research Advancement Act, United States Senate, 02/2019, Washington, DC

5. NSFK: Getting to Quality Content, Common Sense Media, 05/2019, Mountain View, CA

6. Mobile and Interactive Media Use by Children: Design and Policy Implications, Seton Hall Law School Privacy Conference, 11/2019, Newark, NJ

7. House of Representatives Round Table regarding the Children and Media Research Advancement Act, United States House of Representatives, 05/2020, Washington, DC

8. Thinking Beyond Screen Time: Developmental Processes and Design, New York Academy of Sciences, 07/2020, New York, NY (webinar)

9. How Do Dark Patterns Target Kids and Teens?, Federal Trade Commission Workshop on Dark Patterns in Technology Design, 04/2021, Washington, DC

10. Children with Special Needs During COVID-19, New York University, 05/2021, Virtual

11. Stealth Advertising and Children: Developmental Considerations, **Radesky J**, U.S. Federal Trade Commission, 10/2022, Washington, DC (virtual)

12. Roundtable with Surgeon General Vivek Murthy regarding Social Media and Youth Mental Health, **Radesky J**, U.S. Surgeon General's Office, 03/2023, Washington, DC (virtual)

13. New York Child Mental Health Summit: Keynote Panel on Youth and Social Media, **Radesky J**, New York State Governor's Office, 06/2023, New York, NY

14. Children and Social Media, **Radesky J**, Children's Health Fund, 07/2023, New York, NY (virtual)

15. Parenting and Media, **Radesky J**, Research presentation on parent-child relationships and media, Children and Screens: Institute for Digital Media and Child Development, 09/2023, Washington, DC

16. Commercialism and Childhood, **Radesky J**, Presentation on commercial influences in media, Children and Screens: Institute for Digital Media and Child Development, 09/2023, Washington, DC

17. Commercial Determinants of Child Health, **Radesky J**, Annual PRISM Social Media Research Conference, PRISM Institute, University of California San Francisco, 12/2023, San Francisco, CA

18. SAMHSA Mental Health Conference: School mental health panel, **Radesky J**, Substance Use and Mental Health Services Administration, 05/2024, Washington, DC

Seminar

1. Digital Media and Parent-Child Interaction, Georgetown University Developmental Science Colloquia, 04/2018, Washington, DC

2. Youth-centered approaches to researching media and child wellbeing, **Radesky J**, National Institutes of Mental Health Director's Innovation Speaker Series, 11/2024, Bethesda, MD

Intramural Invited Presentation

Keynote

1. Promoting Mental Wellbeing and Healthy Relationships with Social Media, **Radesky J**, University of Michigan Fundamentals of Nursing Conference, 05/2024, Ann Arbor, MI

Panel

1. Enhancing Your National Reputation, Michigan Medicine, Faculty Development, 09/2023, Ann Arbor, Michigan

Publications/Scholarship

(Co-First Author *; Corresponding author **; Co-Last author ***)

Peer-Reviewed

Journal Article

1. Danet M, Miller A, Weeks H, Kaciroti NA, **Radesky J**: Children aged 3-4 years were more likely to be given mobile devices for calming purposes if they had weaker overall executive functioning. *Acta Paediatrica*.111(7): 1383-1389, PM35238076

2. Suh B, Kirkorian H, Kucher S, Barr R, Torres C, **Radesky J**: Measuring Parents' Regulatory Media Use for Themselves and Their Children. *Frontiers in Developmental Psychology*. ,(In Press)

3. Sun K, Gelman S, **Radesky J**, Yip J, Schaub F: "Why is Everything in the Cloud?":Co-Designing Visual Cues Representing Data Processes with Children. *Interaction Design for Children*. ,(In Press)

4. Baughan A, Alsabeh D, **Radesky J**, Rich M, Hiniker A: Investigating Attention and Normative Dissociation in Children's Online Social Games. *Interaction Design for Children*. ,(In Press)

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13. **Radesky JS**: The social-ecological context of media use and school success. *J Pediatr (Rio J)*.91(4): 318-319, 01/2015. PM25976266

14. **Radesky JS**, Schumacher J, Zuckerman B: Mobile and interactive media use by young children: the good, the bad, and the unknown. *Pediatrics*.135(1): 1-3, 01/2015. PM25548323

15. **Radesky JS**, Kistin C, Eisenberg S, Gross J, Block G, Zuckerman B, Silverstein M: Parent Perspectives on Their Mobile Technology Use: The Excitement and Exhaustion of Parenting While Connected. *J Dev Behav Pediatr*.37(9): 694-701, 01/2016. PM27802256

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Non-Peer Reviewed

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Letter

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Note

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Patient Education Material

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